

JPRS 77749

3 April 1981

# East Europe Report

SCIENTIFIC AFFAIRS

No. 699

**FBIS** FOREIGN BROADCAST INFORMATION SERVICE

#### NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [ ] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

#### PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service, Springfield, Virginia 22161. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semi-monthly by the National Technical Information Service, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available from Bell & Howell, Old Mansfield Road, Wooster, Ohio 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

3 April 1981

# EAST EUROPE REPORT

## SCIENTIFIC AFFAIRS

No. 699

### CONTENTS

#### INTERNATIONAL AFFAIRS

Czechoslovakia, USSR Cooperate in Microtron Production (SVOBODNE SLOVO, 31 Jan 81).....	1
Results of Soviet-Hungarian Space Research (Pal Gabor Peto; NEPSZABADSAG, 27-29 Jan 81).....	4

#### BULGARIA

Test Results of Coking Crude Oil and Oil Residues (Dimitur Rushev; KHIMIYA I INDUSTRIYA, No 9, 1980).....	13
--	----

#### CZECHOSLOVAKIA

Laser Acupuncture Found Effective in CSSR (Radimir Ruzicka; JEMNA MECHANIKA A OPTIKA, Dec 80).....	19
Electronics Development in Tesla Roznov (RUDE PRAVO, 28 Jan 81).....	24
New Pharmaceuticals Aid Livestock Production (J. Parik; ZEMEDELSKE NOVINY, 28 Jan 81).....	27
Briefs New Research Facility Inaugurated.....	32

#### HUNGARY

Present Status, Future of Hungarian Nuclear Physics (Denes Berenyi; MAGYAR TUDOMANY, No 12, 1980).....	33
Central Physics Research Institute Develops Set of Nuclear Instruments (MUSZAKI ELET, 6 Feb 81).....	38

**Multifaceted Cyclodextrins**

(Eva Fenyvesi, Eva B. Dosó; MAGYAR TUDOMÁNY, No 12,  
1980).....

**41**

**Abstracts**

**Biomed and Behavioral Sciences.....**

**48**

CZECHOSLOVAKIA, USSR COOPERATE IN MICROTRON PRODUCTION

Prague SVOBODNE SLOVO in Czech 31 Jan 81 p 10

[Article: "What Is the Microtron?"]

[Text] As we have already noted, at the beginning of the year the first Czechoslovak microtron, a cyclical electron accelerator, was put into operation. It is the only device of its kind in the socialist countries, and accordingly we asked Eng Zdenek Randa, candidate of sciences, of the Institute of Mineral Raw Materials in Kutna Hora, for a more detailed explanation.

The reader who is not well versed in the secrets of nuclear engineering may not even be aware of the further stride forward which Czechoslovak nuclear engineering has made in the peaceful use of atomic energy. This equipment, developed as part of the State Plan for Development of Science and Technology for the period of the Sixth Five-Year Plan, financed by the Czechoslovak Atomic Energy Commission and the Czech Geological Administration and coordinated by the Institute of Mineral Raw Materials in Kutna Hora, was built in the facilities of the Faculty of Nuclear and Physical Engineering, Czech Institute of Technology in Prague in close cooperation with the Joint Institute of Nuclear Research in Dubna, near Moscow. Prof C. Simane, Eng M. Vognar and Eng. V. Kliski, who carried out the task, add that thanks to this cooperation two microtrons were actually built. One is operating in the laboratory of Academician Flerov in the Joint Institute, and its twin is here in Prague. The experience and documentation of the Soviet nuclear experts were used; some of the parts were built in Czechoslovak enterprises and others in Soviet enterprises.

A Cyclic Accelerator

Just what is a microtron, and for what will it be used? As has already been stated, it is a modern version of the cyclic electron accelerator. Electrons produced by a special glowing cathode are accelerated in a transverse magnetic field by a high-frequency field in a hollow resonator. In each pass through the resonator they gain an energy of about 1 MeV (million electron volts). Because the acceleration process takes place in a magnetic field, the electron paths are curved. As the energy of the electrons increases, the diameter of the circles becomes larger (by approximately 3 or 4 centimeters), and the circles (orbits) meet within the resonator. By the end of acceleration the electrons have

acquired an energy of about 22 MeV. They are brought out of the acceleration chamber, where there is a high vacuum, in a tangential direction by a magnetically screened channel, and are made to strike a hard-alloy target, the so-called "converter" (tungsten, tantalum or platinum). Here the electrons are decelerated and their energy is radiated in the form of bremsstrahlung. Even though this concept may mean nothing to you, everyone who reads these lines has already encountered bremsstrahlung or knows it by another name. It is simply continuous X-rays, with the difference that in an X-ray device the X-rays are linearly accelerated, at a potential of only 60-100 kilovolts, while in the microtron the electrons acquire energies in excess of 22 million volts. It is no wonder that this bremsstrahlung easily passes through not only the body, but even steel plates several tens of centimeters thick. The energy of the bremsstrahlung is so great that it is even able to induce photo-nuclear reactions, in other words to produce man-made radioactive substances from nonradioactive materials.

#### For Analytical Uses

And this is one of the main reasons why the microtron is built in Czechoslovakia. Not, of course, specifically for the production of radionuclides, but for gamma activation analysis, which uses this radioactivity for analytical purposes. Activation analysis in turn will be used primarily for geological purposes. It should be added that the microtron has a multitude of uses, for example in dosimetry, flaw detection, radiochemistry and the like. The information that there is 150 milliwatts of power per square centimeter on the axis of a bremsstrahlung beam does not seem very informative. But if one adds that this is equivalent to about 100,000 roentgens per minute and that the human lethal dose is 400-500 roentgens, it is clear that the microtron is not to be trifled with.

Since we have already mentioned activation analysis, which in connection with the needs of geology in Czechoslovakia will be one of the main areas of use of the microtron, we should explain this modern and promising analytical method in more detail. The principle is that specimens and standard samples are irradiated with neutrons, photons or other nuclear particles and the artificially induced radioactivity is used for qualitative and quantitative determination of the components. Today neutron activation analysis (NAA) is already extensively used in routine work, primarily in purely instrumental form. (Here the main components in the sample are determined nondestructively, without chemical decomposition.) The high efficiency of the method results from the fact that as many as 400 components can be determined simultaneously. Semiconductor gamma ray spectrometry is used for the purpose. Detectors made from specially prepared high-capacity germanium or silicon diodes are able to distinguish even very closely spaced gamma radiation lines, and accordingly chemical separation of the individual elements is not necessary. Incidentally, in the late 1960's Czechoslovakia was one of the first countries in which these detectors were operated, in the Institute of Nuclear Research in Rez. Neutron activation analysis using irradiation with a powerful stream of electrons in a nuclear reactor is capable of determining even the incredibly small concentration of  $10^{-12}$  grams (a millionth of a millionth of a gram) of a component. This is one of the most sensitive of all analytical methods.

## Use in Geology

One of the main areas in which NAA finds extensive use is geology. A large number of institutes and enterprises, such as the Institute of Mineral Raw Materials in Kutna Hora, the Institute of Nuclear Research in Rez, Geindustria Praha, the Czechoslovak Uranium Industry, Geofyzika Brno and others already use this method in series work to determine a wide variety of trace and secondary components. These include the lanthanide rare earths, thorium, uranium, hafnium, rubidium, cesium, gold, cobalt and a number of others, mostly exotic. Today concentrations of these as low as thousandths or tens of thousandths of a percent or lower can be determined, which is obviously necessary for geochemical and mineralogical purposes, since this tells investigators where or how a given mineral originated. This in turn makes it possible to draw conclusions about its further relationships, for example where in the vicinity of a mineral find economically important raw materials might be expected to occur. Not only geologists, but specialists in other areas too need comprehensive information on the composition of minerals. The beautiful and world-famous products of the Czechoslovak glass industry, for example, could certainly not do without the rare earths. And electronics requires them: the luminophores on the color television screen would not produce color without yttrium, samarium and europium. Nor could nuclear power production do without uranium, thorium, niobium, zirconium and cadmium.

## A Need for Modern Analysis

In the case of a number of metals the concentrations in ore which are considered economically interesting are steadily decreasing as a result of the exhaustion of rich deposits and the rapid rise of prices on world markets. For example, it now pays to extract gold-bearing rock with a gold content of about 2 grams per ton of ore. Accordingly, modern highly productive and sensitive analytical methods are needed. Unfortunately, like any other analytical method, NAA is not universal and cannot be used for certain components. Accordingly radioanalysis specialists welcomed with pleasure the report that the first Czechoslovak microtron was in operation. This will complement the area of application of neutron activation analysis with the capacities offered by gamma activation analysis using the microtron. It will be possible to determine yttrium, zirconium, niobium, tin, iodine, gold, thallium, lead and many other components in sample from geological reserves, ore dressing, plant and animal processes, and in aerosols during monitoring of environmental pollution and the like with precision to within fractions of a microgram. For example, the startup of the microtron created the real preconditions for developing a method which would make it possible to determine gold in extracted ore rapidly and rather cheaply with a precision within tenths of grams of gold per ton.

8480

CSO: 2402



RESULTS OF SOVIET-HUNGARIAN SPACE RESEARCH

Budapest NEPSZABADSAG in Hungarian 27, 28, 29 Jan 81 p 6

[Articles by Pal Gabor Peto: "How Did the Pille Score?"]

[27 Jan 81 p 6]

[Text] One of the great events of the last year, at least from a Hungarian viewpoint, was the participation of the first Hungarian astronaut, Bertalan Farkas, in the Interkosmos program. Although such a task undeniably requires diligence, initiative and a great deal of courage, the flight of Bertalan Farkas was basically scientific work. His title of research astronaut on board of Soyuz-36 and Salyut-6 was more than a mere formality.

There have been "Hungarians" on board of Soviet research rockets, spaceships and space stations before Bertalan Farkas: Hungarian experts designed and produced a number of instruments and also took part in the processing of data collected in space. There have been such instruments on the flight with Bertalan Farkas (not to mention his memorable meals, whose preparation was no mean scientific achievement).

Evaluation of the scientific results obtained in the course of last year's Soviet-Hungarian space experiment is still in progress. The job is quite enormous (there is a great quantity of data), requiring a great deal of care because a wrong move may destroy the result of an experiment that is perhaps unrepeatable. Other experiments will be repeated or continued, just as some of the investigations carried out by Bertalan Farkas were repetitions or continuations of earlier ones; thus, no data has been published regarding these. Some of them, however, can now be discussed.

When the radiation dosimeter developed and produced by the Central Physics Research Institute, named "Pille", was delivered to Soviet specialists before the joint space flight, they insisted on making a note of their appreciation in the record, while emphasizing the uniqueness of the instrument. This was not just politeness: the "Pille", whose weight is less than one kilogram, is indeed an excellent product that its creators can be proud of; and the nation may be proud of them.

Astronauts are exposed to harmful ionizing radiation exceeding earth surface levels even in the relatively low atmospheric layer where the spaceship travels, below



the high-radiation Van Allen belt. In addition, one must expect strong bursts of radiation due, for example, to solar eruptions. For this reason, precise dosimetry within spaceships is very important. But more than precision alone is required: the instrument cannot take up a great deal of space within the spaceship where everything needed for such a fixed group of tasks must fit in. Weight is another factor that must be considered.

The Pille made by KFKI [Central Physics Research Institute] has fulfilled all of these requirements on a high level. As we said before, it weighs less than a kilogram and requires a power supply of only 3 to 4 watts. Its operation is simple: the little detectors, shaped like a pencil with an end that is similar to a key, located on the astronauts' body and various locations within the spaceship, are inserted into a receptacle on the "Pille". A light comes on indicating that the instrument is ready for measurement. The detector is then turned using the key-shaped handle; another light comes on indicating measurement in progress. In just one minute, the face of the Pille will display red numbers with a height of 7 millimeters, indicating the radiation dose detected by the dosimeter since the last readout. Each readout will rezero the instrument, i.e., it will be returned to the initial state. For reasons of power conservation, the numbers will go out in 5 seconds. Pressing another button will cause the numbers to be displayed again. The data is preserved within the Pille until the next readout.

#### Sixteen Detectors

How did the Pille pass the test on board of Salyut-6?

During his stay on the space station, Bertalan Farkas measured radiation doses detected by the dosimeters twice: on 28 May and on 2 June. On both occasions he had to record data from 14 dosimeters, since all four astronauts had dosimeters attached to their suits, 8 more were placed in various locations within the space station and, finally, there were 4 more detectors placed there for control purposes, 2 of which were read on each occasion. These 4 detectors differed from the other 12 in that they were irradiated on Earth before the flight, using a rather large dose: they received 870 millirads or, to use current SI units, 8.7 mGy (milligray).

It must be mentioned that evaluation of the data obtained is not a very simple task: the individual sensitivity of each detector must be taken into consideration (resulting in a small deviation of data), together with the fact that prior to the flight the dosimeters also recorded the so-called natural background radiation here on earth.

#### Under the Allowed Limit

Researchers are still debating the size of the smallest radiation dose that is capable of causing damage to a human body. For practical purposes, they settled on an allowed radiation dose of 5 rad/year (or, using current units, 0.05 Gy/year). In terms of daily doses, this is equivalent to 14 millirads/day or 0.14 mGy/day.

Measurements show that the astronauts were exposed to daily radiation doses far below the allowed radiation levels which were set very conservatively. Doses were

between 6.3 mrad and 10.9 mrad. Thus, the health of the astronauts was not in danger. (It is interesting, say the experts, that doses measured in 1980, at least during the flight in which Bertalan Farkas was a participant, were lower than those measured during the several months of the 1979 space flight using a different type of dosimeter.

The measurement results of calibration detectors provided an important and very good result. The discrepancy between expected and measured values was very small. The small size of the discrepancy in terms of percentages prove that the personal dose measurements carried out in space were precise and reliable.

In fact, the experts were supposed to receive this data only after the landing but, as we found out from their representative who was present in the control center during the space flight, Bertalan Farkas communicated these data from the spaceship, thus "overfulfilling the plan". By the way, our astronaut has recently visited KFKI where he talked with the designers of the Pille and had high praise for this convenient, clever and easy-to-operate instrument.

Although, strictly speaking, this is not part of our subject, our readers will probably be interested in two aspects of the future of the Pille. One is that the indicator of the 4 instruments already completed at the request of Soviet specialists to be used in the next space flight contains a decimal point, i.e., the precision of the readout will be improved by an order of magnitude.

#### Forward - to Day-to-Day Applications

Another fact of interest: the KFKI also produced a variant of the Pille capable of working off a 12 volt power supply, e.g., a car battery. This is intended to be carried by car in the vicinity of the nuclear power plant for instant evaluation of radiation doses detected by the dosimeters and filtering out background radiation doses with a distorting effect of data. In this way, space research is related to the solution of scientific and health protection tasks here on earth: this is one of the revealing aspects of this great enterprise.

[28 Jan 81 p 6: 2. "16,000 Photographs"]

During the joint Soviet-Hungarian space flight NEPSZA3ADSAG published an article titled "Photo Cosmos" which, according to its subtitle, discussed the subjects photographed by our astronaut and the purpose of such photographs. Bertalan Farkas has photographed many things: he photographed pre-defined areas in accordance with meteorological conditions but he was unable to take pictures of Hungary using his MKF-6 camera made in the GDR (capable of photographing in 6 separate frequency bands or "colors"). When the Salyut-6 spaceship flew over our country it was late afternoon and the amount of light was insufficient for photography. When the spaceship was in this region during lighter periods, our country was just on the horizon.

#### Natural Resource Exploration

Nevertheless, the pictures made in the course of the joint space flight are very valuable to Hungarian experts. The same is true for the ones made by Bertalan

Farkas: they are related to earlier space photos and are useful in formulating a remote sensing method that is still largely in an experimental stage. For example, a comparison of pictures of river estuaries with earlier space photos of the same regions reveals some changes. In addition, the photos and observations made by Bertalan Farkas make it possible for Hungarian specialists to ask more precise questions of the astronauts taking part in future space flights.

In addition, very valuable photographs were made in the course of other spaceflights besides the one on board of the Salyut-6 last May; this underlines the fact, frequently ignored by many, that the official term "joint space experiment" is used in place of "joint space flight" for a good reason. There have been other joint experiments concurrent with the activities of Bertalan Farkas.

One of the most important projects involved aerial photography aimed at natural resource exploration combined with space photos of Hungary made in 1979 by one of the "permanent" crews of the Salyut-6, Lyakhov and Ryumin as well as the pictures made by the crew of a Soviet flying laboratory visiting here at the time of Bertalan Farkas's space flight with the assistance of Hungarian specialists.

The expression "natural resource" is used today in an extended sense. According to a definition formulated by the UN, it includes all facets of nature used by a given society for its own purposes on a given level of development: clean water, mineral resources, plants, biomass, solar radiation, etc. Photographs made originally for purposes of cartography have also been used for natural resource exploration. It is hardly necessary to point out that a photograph made from a height of several thousand meters may be used to survey a much larger area than one made on the surface or from the top of a hill. Aerial photographs were used not only for topographic maps but also for making economic, soil, water resources, etc. maps, collectively called thematic maps by specialists. This method is raised to a higher level by observation and photography from space. But establishing a connection between photographs made from various elevations, which is indispensable for the interpretation of photographs, is a complicated problem. Last year's space flight included some joint work in this direction.

#### The Flying Laboratory and Others

In accordance with agreements, the "flying laboratory" of the Soviet Academy of Sciences installed on board of an AN-30 airplane visited our country last May. This aircraft takes photographs at a height of 6,000 to 7,000 meters using an MKF-6 camera and a multi-band sensor. Simultaneously, Hungarian specialists took photographs from a height of approximately 2,000 meters using AN-2 aircraft. Last but not least, measurements were taken at surface level. This "multi-story" experiment, combined with the Salyut photos of the preceding year, will be suitable for formulating and refining the methodology of natural resource exploration. At the same time, these photographs also serve a practical purpose.

The surface level measurements were made using spectrophotometers made in Bulgaria or obtained from the Baku Natural Resource Exploration Institute of the Azerbaidjan Academy of Sciences. The former is an instrument mounted on a tripod transported from one site to the next and used for measuring the light reflection properties

of the soil and plant cover in various regions of the spectrum. The instrument from Baku, called Kaspil, is suspended from a mobile crane during measurement.

By putting together the measurements obtained at each of the four levels (Salyut-6, AN-30, AN-2, surface), it is possible to draw precise conclusions regarding the status, ripeness and possible illness of crops, purity of water, etc.

As we said last year, three areas of Hungary, each with different characteristics, were picked for this purpose: the Lake Balaton region, the portion of the Tisza-2 dam complex between Szolnok and Kiskore and the region surrounding the village of Penc where the Cosmic Geodesic Observatory is located. On this occasion we will present a few photos from the Lake Balaton project, courtesy of the MTA [Hungarian Academy of Sciences] Intercosmos Council, the organization responsible for coordinating the work of the many participants. (We are grateful to Peter Szilagyi, main department head of the MEM [Ministry of Agriculture and Food Industry] National Geodesic and Cartographic Office for the technical information.)

For Example, Lake Balaton ...

The photo made by Salyut-6 was 185x185 millimeters showing an area of 36,000 square kilometers, i.e., more than one third of the area of Hungary (in our case, West of the Danube up to the Western border). Our Figure 1, showing part of Lake Balaton and the Tihany peninsula, was enlarged from this photo (the enlargement was five-fold, but it is possible to enlarge this picture by another factor of 20).

The next figure shows the same area; it is one of the six photos made by the six MKF-6 cameras on board of the AN-30; more precisely, it is an enlargement of part of one of these 6x9 cm photographs. Part of the Inner Lake is clearly visible in the upper left corner of Figure 2. In the upper middle part one can see Tihany with part of the road leading out of it; a forest is visible south of the parking lot (downward on the picture). On Figure 3, made in the infrared range, it is possible to distinguish between leafy and coniferous wood.

Differences in picture tone give an indication of the differences between different wavelengths. For example, Lake Balaton is completely dark in Fig. 3 because water does not reflect light in this frequency band.

This series, combined with the measurements from the AN-2 aircraft and those made at surface level (not shown here) is suitable for checking water purity in Lake Balaton, distinguishing types of soils and plants (e.g., trees) as well as achieving further refinements in our method of interpretation.

An interesting discovery in basic science has been made with the help of pictures provided by Salyut-6. Geologists assumed for quite a while the existence of an enormous crack under the surface starting from Zagreb, crossing the Danubius in a SW-NE direction all the way to Klyuch (in Siberia). This fault is visible on the photos made from Salyut-6, and only on these photos (presumably due to a fortunate coincidence of microclimatic, atmospheric and humidity conditions). In contrast to previous assumptions, the fault does not pass through the Southern part of Csepel Island; instead, it goes through Dunaharaszti, which means that it may be related



to the January, 1956 earthquake. The photos also show the existence of a "bend" in the fault: from Dunaharaszti it makes a wide turn toward the Mecsek mountains, then it turns north to Lake Balaton, before continuing toward the southwest.

Many more interesting things could be said about these photos. Various sectors of the national economy could obtain a lot of interesting information from the 16,000 photos made over the same areas in 1979 and 1980. This requires instrumentation (not too expensive, and often quite simple instruments) and especially people who are receptive and supportive of new ideas as opposed to "well-tried methods", and are willing to take on the job of learning new techniques to discover heretofore unknown phenomena. According to specialists intimately familiar with the situation, there is much less enthusiasm in these areas now than at the time of Bertalan Farkas' space flight.

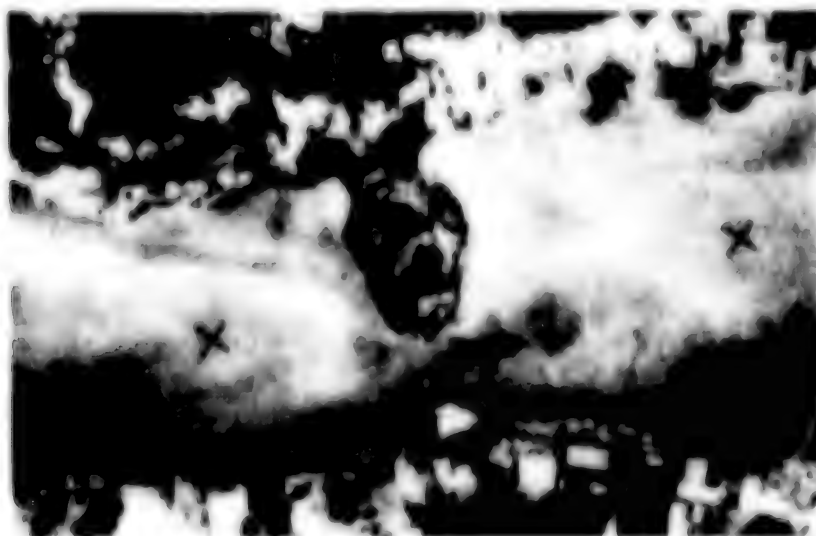
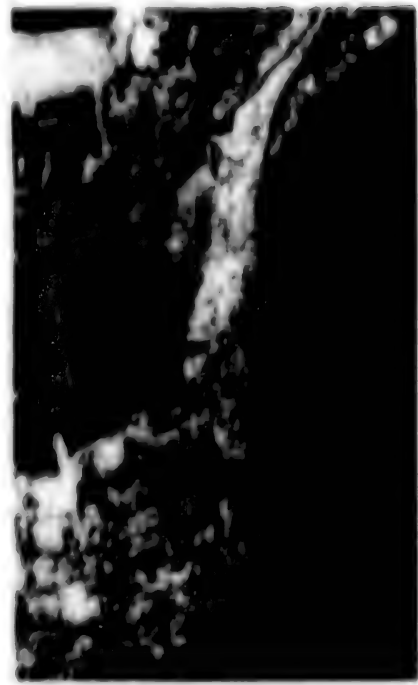


Fig. 1. Part of a photo made from Salyut-6. The Tihany Peninsula is recognizable.



**Figs 2-3**

These photos were made from the Soviet AN-30 flying laboratory.

**Fig 3.** A photo of the same region using infrared-sensitive film, i.e., an invisible frequency range. On this photo it is possible, for example, to distinguish between leafy and coniferous wood in the forest already mentioned. Differences in the color of water also reveal the difference between wavelengths.

[29 Jan 81 p 6: "Photos by Bertanan Farkas"]

Meteorologists were perhaps the first to recognize the potential practical uses of space exploration. Today there are dozens of satellites automatically and continuously sending photos made at various altitudes (from 600 to 36,000 kilometers) showing cloud cover, the birth of hurricanes and other important phenomena.

#### **An Astronaut Sees It Differently**

The question which arises is not completely illogical: what is the continued role of astronauts in meteorological research and photographing objects and phenomena specified by meteorologists?

This is the question I asked of Pal Bozo, head of the remote sensing group of the Central Forecasting Institute of the National Meteorological Service, responsible for coordinating the project aimed at the definition of an observation program, primarily for the benefit of the Hungarian astronaut.

At first, the answer is somewhat surprising. Astronauts have many advantages over automated satellites. The first advantage is that a manned spaceship travels in a lower orbit; as a result, the astronaut has a closer view of clouds. Of course, he sees phenomena in full color and also stereoscopically, using both eyes, which

is very important. In addition, he is capable of selecting and deciding what is to be photographed. Finally, he can observe phenomena continuously.

The World Meteorological Organization operates an international weather observation service called WW. This provides meteorologists with photos containing information about very large scale (macrosynoptic) phenomena, obtained from satellites. But related medium-scale, mesosynoptic phenomena are also very important for weather forecasting. Our small country is especially affected by these processes. Our success in recognizing these mesosynoptic processes early enough has an important influence on whether forecasts come true or not.

#### Chains of Showers, Wave Clouds

This was the starting point for defining the tasks of our astronaut by Hungarian meteorologists. These had to be carried out in part by making color photos using a hand-held camera and in part through observation. Bertalan Parkas made more than 100 photos. Their evaluation is still in progress; they must be compared with other, surface or balloon observations in order to find out the meaning of observed phenomena.

Our astronaut had to concentrate his observations in three areas. First of all, his work was expected to provide data for the forecasting of storm chains which pose the greatest threat to life and property. When more than one storm breaks out (even though a single storm is capable of a great deal of damage, especially because of strong gale winds) and storm clouds line up into a chain, then enormous damage may be expected. Damages may be reduced if warning is provided in time.

Another area where Bertalan Parkas has done meteorological work is the observation of wave clouds. Behind mountains over 900 meters in height, on the side sheltered from the wind, there are usually wave clouds with a characteristic appearance. Their shape, position and density are indicators of the winds and airstreams present in those locations. Since our country is surrounded by mountains, this type of information is very important for us. Our meteorologists are unable to incorporate data on airflows modified by mountains into their forecasts because of the scarcity of data. This work is also the subject of a project called ALPEX involving a great deal of international cooperation. (On this topic, we published a report in our series "Workshops of Hungarian Science" on 25 September of last year discussing the National Meteorological Service.)

#### Convective Cells

Last but not least, the Hungarian astronauts had to carry out observations regarding the atmospheric phenomena called convective cells. These are circular cloud formations resembling a cell. They come in two varieties: in one, clouds are located around the edge of the cell, while in closed cells the clouds are concentrated at the center of the cell. The diameter of such cells ranges from 10 to 100 kilometers.

Convective cells may be found mainly over oceans and other large water surfaces. Recent research showed that the interaction between oceans and the atmosphere is much more substantial than earlier supposed and the effect of oceans on air



circulation is much stronger. Therefore, the generally accepted opinion is that long range weather forecasting is hopeless without considering the effects of oceans.

Bertalan Parkas performed observations and made photographs in each of the three areas mentioned. One of his important observations showed an enormous cloud mass over a region of Africa where, according to the crew of Ryumin and Popov who have spent a long time in space, the air was always clear and dry. True, this surprising phenomenon dissolved after a few orbital revolutions, but it was still a rarity. Aside from that, unfortunately he observed unusually frequent and dense cloud cover. Through his entire flight, the sky was very cloudy. This has not been an obstacle to his meteorological observations but it was a hindrance to his other work.

Of the more than 100 photos we present two, unfortunately only in black and white.

#### Photo Captions:

Fig. 1 In the original, the clouds are visible before a bluish green background: typical wave clouds. The white clouds are a few dozen kilometers in length and are perpendicular to the direction of the wind.

Fig. 2 Photo of a cyclone over the Northern hemisphere. Accordingly, clouds are moving counterclockwise. The original photo is green. The black background is outer space; at the edge, the curvature of the Earth is visible.

9164

CSO: 2502/43

## TEST RESULTS IN COKING CRUDE OIL AND OIL RESIDUES

Sofia KHIMIYA I INDUSTRIYA in Bulgarian No 9, 1980 pp 399-401

[Article by Dimitur Rushev, High Chemical Technology Institute, Sofia; Dimitrios Khristakudis, Mining Academy, Freiberg, East Germany; and Dimitur Dimitrov, Scientific-Industrial Laboratory for Electrothermy, Sofia]

[Text] The following two methods are known and widely used in industry for chemical utilization of carbon-rich residues from reprocessing of petroleum and coal: a) hydraulic cracking of raw materials to obtain a large amount of hydrogen-rich motor fuel and b) "disproportionation" of hydrogen contained in the raw materials by coking, in which most of the hydrogen is liberated with light cracking byproducts, and hydrogen-poor coke is left as the residue. We used the pyrogenetic process in our research which leads to "disproportionation" of the hydrogen contained in the raw material. This process, known as coking, may be accomplished rapidly or slowly.

The end product of thermal destruction by coking is either coke, which is widely used as a carbon source for production of electrode, or the fluid byproduct. In the latter case, the coke is used per se as ordinary fuel. Research carried out at the department of "Fuel Technology" of the High Chemical Technology Institute (Sofia) on thermal destruction of residues from petroleum and coal reprocessing followed two trends [1, 2]. To a certain extent, they explain the suitability of some of these products for binders in the production of electrodes and for other purposes. In [3] the first new findings from the continuation of this research are briefly reported. This study generalizes some of our new test findings in this field.

In the past few years the thermal destruction of a large number of industrial residues was studied under laboratory conditions (various coal pitches, tall oil pitch, pyrolytic resins, residues from the benzene shop, etc.) and laboratory products (semi-coked tar), etc.\* Only the most interesting results from certain typical raw materials (Table 1) are discussed here. From the data shown in the table we can see that some of these raw materials have properties which do not

\*The experimental research was supported by engineers M. Latinova, D. Draganov, N. Nikolov and A. Angelov working on their degrees under the direction of the authors.

favor production of quality coke. An example of such is coal tar pitch I, pyrolyzed petroleum pitch V and residues from the benzene shop VII, which have a very high content of mineral matter, while specimen VII also has a great deal of sulfur.

As has already been established [4], the chemical composition plays a decisive role in the production of high quality coke, in addition to the technological parameters of coking mentioned and the raw material indicators shown in Table 1. Consequently, the structural-group composition of some raw materials was also investigated, defined by means of IR spectroscopy according to Rentrop [5] and Christakudis [6] (data obtained are presented in Table 2). The NMR spectrum was taken from the portion of coal tar pitch III specimen dissolved in deuterated chloroform, yielding the following hydrogen distribution, in %:

Table 1. Physicochemical Indicators of Raw Materials Investigated

	Coal tar pitch			Pyrolyzed pitch	Pyrolyzed resin		Benzene residue
<u>Basic parameters</u>	<u>I</u>	<u>II</u>	<u>III</u>	<u>IV</u>	<u>V</u>	<u>VI</u>	<u>VII</u>
Softening temperature by combustion & ring method, °C	60	79	89	115	140	--	--
Coking value, %	32.5	36.6	43.1	47.3	39.4	14.5	20.8
Ash, %	0.73	0.18	0.33	0.44	0.80	0.04	0.76
Relative density	--	--	1.28	1.28	--	1.03	--
Elementary composition, %							
C	--	--	91.8	92.4	92.6	93.0	--
H	--	--	4.24	4.33	5.62	6.65	--
S	0.60	0.49	0.60	0.60	0.12	0.11	2.92
Insoluble matter, %							
Benzene	16.5	--	21.5	32.6	--	0.32	--
Toluene	--	--	23.4	36.4	--	--	7.1
Quinoline	0.7	--	0.5	0.6	--	0.0	--
Acetone	--	--	32.4	39.8	--	4.6	--

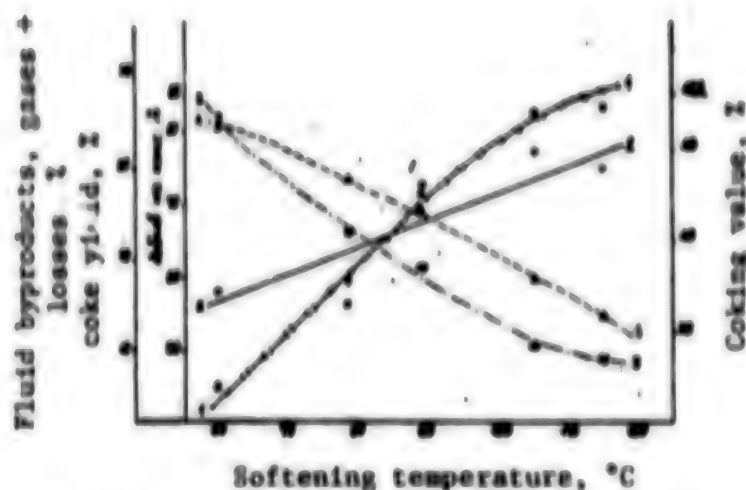


Figure 1. Coking value (1), coke yield at 650°C (2), fluid byproducts (3) and liberated gas [100-(coke + distillate)] (4) versus softening temperature of pitch.

Table 2. Structural-Group Composition of Some Coked Raw Materials

Distribution of H & C	Coal tar pitch III	IV	Pyrolyzed pitch V
H distribution, %			
CH <sub>ap</sub>	2.10	2.17	2.12
CH <sub>3</sub>	0.45	0.34	0.71
CH <sub>2</sub>	0.16	0.22	0.90
CH	1.53	1.60	2.09
C distribution, %			
CH <sub>ap</sub>	25.2	26.0	25.4
CH <sub>3</sub>	1.8	1.4	2.8
CH <sub>2</sub>	1.0	1.3	3.4
CH <sub>apa</sub>	45.4	44.5	33.9
CH	18.4	19.2	25.4
Degree of aromatization (f <sub>a</sub> )	0.77	0.76	0.64
Ring content, %	3.6	3.6	3.4
aromatic CH-groups			3.41
nonaromatic compounds CH-, CH <sub>2</sub> - and CH <sub>3</sub> -groups			0.15
aromatic compounds CH-, CH <sub>2</sub> - and CH <sub>3</sub> -groups			0.68

Coking experiments were conducted on equipment described in [3]. Industrial coking in iron retorts was completed at 650°C, whereas laboratory tests were conducted gradually using the same type of iron retort with a volume of 500 cm<sup>3</sup>. A temperature of 550°C was achieved which best suited the process temperature for "delayed coking." One experiment studied the effect of pressure on coking. At the Chemistry Laboratory of the Mining Academy in Freiberg, East Germany, specimen III (Table 1) was coked at 0.49 MN/m<sup>2</sup>, temperature 500°C, and static conditions for 20 hours.

Experiments were first conducted for coking of about 1,200 grams in a large iron retort under normal pressure (material balances obtained in the research are shown in Table 3). Coking of coal tar pitch produced much higher coke yields than expected (58.8 to 75.1%). As shown by the graphs in Figure 1, the yield depended on the softening point of the pitch and its coking value; the coking value and coke yield are in direct proportion to the softening point.

Table 3. Material Balances of Coking at 650°C and Normal Pressure

Type of material coked	Yields, %		
	Coke	Distillate	Gas + losses
Coal tar pitch:			
Specimen I	58.8	23.0	18.2
Specimen II	60.0	16.9	23.1
Specimen III	72.1	14.5	13.4
Specimen IV	75.1	9.9	15.0
Pyrolyzed resin (specimen VI)	24.3	63.8	11.9
Residues from benzene shop (specimen VII)	21.0	57.2	21.8
Coal tar: pyrolytic resin, 1:1 ratio	37.0	54.5	8.5

Coal pitch III specimens were used for pressurized coking (see Tables 1 and 2). The following yields were obtained (percents): coke 75.5, distillate 13.5 and gas + losses 11. Furthermore, in the first 150 minutes of coking, 21 cm<sup>3</sup>/g of gas was separated, while at the end of the process the fluid distillate had a density of  $d_4^{20}$  1.1193 and bromium number of 7.5. This experiment showed that coke yield (Figure 1) is somewhat higher than that obtained under normal pressure. Consequently, in coking of coal pitches, the pressure exerted had a small effect on the yields of coke, distillate and gases. Test results of one of us [6] showed that when coking pyrolyzed resin at a pressure of 0.49 MN/m<sup>2</sup>, yields of coke ranged from 30 to 40 percent. These data clearly indicate that coking tests of such readily boiling raw materials must be conducted under pressure, because this can alter the yield and structure of the coke.

In order to establish coking technology, we must know the properties of the fluids produced in coking. This is especially important if recirculation is used in which the distillates are again subject to coking. Because of this some fluid products obtained in coking are subject to distillation and fractions which boil above 240°C are re-coked. The results of these studies are shown in Table 4. Results from coking of specimen V under identical conditions are also given for comparison. Test data show that a much higher coke yield can only be expected in specimen V (pyrolyzed pitch) if fluid products from coking are recirculated.

Physicochemical indicators enable us to make an initial estimate of the quality of coke produced. In Table 5 are given some coke indicators obtained under normal pressure and at a temperature of 650°C. Nearly all specimens contain too much mineral matter, which is explained by the high content of mineral matter in the source raw materials. A large amount of mineral matter may come from the materials of the retort (high iron content), and for that reason further coking tests must be conducted in corrosion-proof stainless steel retorts. With the

exception of coke from residues from the benzene shop, all other specimens have a relatively low sulfur content. The high content of sulfur and mineral matter makes these raw materials unsuitable for coking.

Table 4. Material balances in Coking of Fluids Products at 550°C

Yield, %	Type of raw materials			
	Original specimen	Fluid products from specimen		
	V	III	IV	V
Coke	57.1	11.3	1.2	23.4
Distillate	22.5	56.3	68.8	75.0
Gas + losses	20.4	32.4	30.0	1.6

Table 5. Coke Indicators

Basic parameters of coke	Type of specimen (Roman numerals correspond to those in Table 1)							Mixture of coal tar pitch and pyr. resin
	I	II	III	IV	V	VI	VII	
Ash, %	1.23	0.30	0.66	0.51	1.37	0.78	1.74	1.01
Sulfur, %	0.54	0.42	0.50	0.50	0.03	0.23	1.26	0.52
Volatile matter, %	2.7	1.5	3.4	2.8	2.1	3.6	1.6	7.8
Density (actual), g/cm <sup>3</sup>	1.47	1.49	1.51	1.57	—	1.54	—	1.38
Porosity, %	30.5	27.5	31.8	33.3	—	36.2	—	25.1

#### Conclusions

Coking in an iron retort manufactured by SMK "Kremikovtsi" of various kinds of coal tar pitches produced 60-75 percent coke, whose yield depends on the softening point of the pitch and, to lesser extent, on pressure. Because of the low degree of aromatization of pitch obtained from pyrolyzed resin at SK "Neftokhim," the coke yield is inversely proportional to the softening point and can be raised by recirculating fluid distillate.

#### BIBLIOGRAPHY

1. Gerasimov, M., Rushev, D., Slavomirov, G., TEZHKA PROMISHLENOST 8, 5, 1959.
2. Gerasimov, M., Rushev, D., Slavomirov, G., KHIMIYA I INDUSTRIYA 31, 8, 1959.
3. Rushev, D., Shopov, G., Bekyarova, Ye., et al., KHIMIYA I INDUSTRIYA 50, 2, 1978.

4. Khristakudis, D., Angelova, G., Gerasimov, M., Rushev, D., KIMIYA I INDUSTRIYA 52, 353, 1980.
5. Rentrop, K., FREIBERGER FORSCHUNGSHEFTE A 559, 1976.
6. Christakudis, D., Dissertation B from the Mining Academy, Freiberg, 1979.

8818

CSO: 2202



## LASER ACUPUNCTURE FOUND EFFECTIVE IN CSSR

Prague JEDNA MECHANIKA A OPTIKA in Czech No 12, Dec 80 pp 341-342

[Article by Dr of Medical Sciences Radimir Ruzicka, Railroad Hospital and Polyclinic, Olomouc: "The Use of Lasers in Acupuncture"]

[Text] The author indicates the possibility of using a low-power (0.2-10 mW) He-Ne laser to stimulate the acupuncture points in the treatment of a number of illnesses. Laser acupuncture has been used with almost 1,000 patients; no cases of worsening of the illness or harm to the patient have been observed. A comparison of the AKUPLAS (MBB) and LA1002 (Metra) devices establishes the possibilities for using them. The possibility of combining the LA1002 He-Ne laser with a detector and an AKUDIAST (Metra) skin impedance measuring device, thus making it possible to ascertain the most suitable duration of application of the beam and to determine one measure of the results of the treatment, is noted. In certain disorders laser acupuncture produces results similar to those of classical needle acupuncture and in addition has a number of advantages over the latter.

Acupuncture is one of the oldest methods of traditional oriental medicine. It stems from the knowledge that there are interconnections between the surface of the body and the internal organs and that suitable stimulation of certain points, the so-called "acupuncture points," on the surface of the body or in the subcutaneous layer or muscle, makes it possible to correct the function of internal organs which has been disrupted and thus to affect a cure. The acupuncture points are distinguished from the surrounding skin by altered metabolism and an altered skin resistance and potential.

Stimulation of the acupuncture points can be done in various ways. Classical acupuncture uses needles, ingipuncture [moxibustion] uses the heat of burning moxa cigarettes or cones, and manupressure uses simple pressure of the fingers.

The development of the means of production and the accompanying development of technology have had an effect on acupuncture as well. The acupuncturist's initial tools, thorns or stone fragments, were replaced as time passed by metals, initially the rare metals and later stainless steel alloys; an electric current

was ultimately introduced into the needles, and sometimes they were entirely replaced by electric current or other agencies (e.g. ultrasound). Similarly, in ignipuncture the burning cigarettes and cones were replaced by various sources of heat radiation. In the last decade, lasers have come to be used in certain sectors of medicine, with acupuncture significant among them.

The laser's effect on living tissue results from absorption, which differs according to the type of tissue and depends on the wavelength of the beam. The penetrating ability of the laser beam is particularly great in the spectral region from 0.5 to 0.8-1.1 micrometers. Above and below this region there is considerable absorption of the radiation in thin layers of tissue, with conversion into heat energy.

The technical revolution has made it possible to measure the electrical characteristics of the skin, so that it is possible not only to detect the acupuncture points more easily, but also to measure objectively the organism's response to acupuncture procedures.

All functional disturbances and algic [pain] states are the domain of acupuncture. I will cite only a few at random:

- disorders of the peripheral nervous system, including sensitivity and motor disturbances;
- autonomic vascular disturbances;
- mild endocrine disturbances;
- allergic disorders;
- dyskinesia of the gastrointestinal tract and biliary ducts;
- disorders of the muscles and joints.

In recent years acupuncture has been used for its pain-deadening effects in surgery.

The aims of the present study were:

1. to evaluate the possibility of replacing acupuncture needles with a laser beam, and
2. comparison of two treatment methods in terms of the results.

Before acupuncture with lasers was introduced into human medicine, its effects were tested on animals.

Inflammations were induced in several groups of laboratory rats and the analgesic effects of acupuncture and laser acupuncture were compared with those of known analgesics and anti-inflammatory medicines. The results confirmed that the laser beam had a significant effect on the acupuncture points.

My selection of patients for treatment was based on the fact that acupuncture acts principally on the pathological reflex arc by interrupting its pain component, thus enabling the reparative process to operate in the organism. It is particularly applicable in case of predominance of functional components associated with pain.

In human medicine, our organization used the laser beam to treat patients with:

- migraines and other headaches;
- bronchial asthma;
- gastric and duodenal ulcers;
- disorders of large joints and the spine;
- progressive polyarthritis;
- a number of other disorders (for example, enuresis nocturna, myopia, perceptual hearing impairment and tinnitus).

The patients were chosen at random. During the last 4 years our organization used laser acupuncture with 965 patients, including 573 men and 392 women. Their ages ranged from 4 to 70 years, with an average of 44.5 years. The durations of the complaints also varied from 1 to 26 years, with an average of 13.3 years.

Classical needle acupuncture was conducted with 4,850 patients with the same disorders as were subjected to laser acupuncture. There was no essential difference in the age composition of the groups or in the duration of the complaints. In the case of classical acupuncture, sedative methods of treatment were used with the needles left in place for 20 minutes, at the same points as used for laser acupuncture.

The acupuncture points were selected according to diagnosis and according to an electrometric test of skin impedance using the AKUDIAST instrument (produced by Metra Blansko national enterprise) at the end points of the individual acupuncture paths. Measurements were made in the 0-500 kilohms-2 megohms impedance range with a 1 kHz sinusoidal measuring signal. Overall, more than 5,000 measurements were made at active points, including almost 3,000 with laser acupuncture. The skin impedance was determined before and after the acupuncture session and after conclusion of the entire course of treatments, which averaged 10 sessions (minimum 6, maximum 15). The measurements and investigations were conducted at the same time of day under the same conditions. In a single session an average of 6 points (4-8) on each patient were irradiated. The duration of action of the laser radiation was 30 seconds on each point.

A 0.2 mW AKUPLAS He-Ne laser, produced by MBB, which could be modulated from 20 to 50 Hz or produce a continuous beam was used in the treatment of 315 patients. It is probable that high frequencies are more suitable in deadening processes and low frequency radiation in tonicizing treatment.

Because of the small penetration of the beam into the tissue (about 3-9 mm, according to the manufacturer), a higher power (4-8 mW) Czechoslovak-produced He-Ne laser (Tesla) was used with other patients, and finally a Metra LA1002 with 130 patients. A mirror arrangement was initially used to guide the beam (with the exception of the AKUPLAS); fiber optics were used later. No difference in results was found for the different means of directing the laser beam.

Comparison of the results of the two types of treatment indicated that laser acupuncture produces good results in the treatment of the disorders mentioned; its effect was very close to that of classical acupuncture for certain disorders.

The effects of the two treatment methods were evaluated in terms of:

1. subjective criteria expressed by the patient;
2. objective lessening of symptoms in clinical examination;
3. results of laboratory findings on the patients;
4. electrical measurements made during and after the treatment.

The electrical measurements involved primarily skin impedance, which changed during treatment as the patient's objective and subjective condition improved, returning to normal values.

On the basis of our evaluation of the instruments used we may state that the AKUPLAS is a suitable substitute for acupuncture needles in certain disorders involving auricular acupuncture, and in skin and mucous membrane defects, where it has the effect of accelerating epitheliation, and in stimulation of innervated skin areas. On account of its relatively small penetration, stated by the manufacturer to be 3-9 mm, it is not suitable for ordinary acupuncture. For this purpose it is better to use He-Ne lasers produced here (by either Tesla or Metra), which penetrate as far as several centimeters.

Even though it has thus far been impossible to elucidate the mechanism of lasers' effects in acupuncture, we have certain partial results. When the acupuncture points are stimulated with the laser, there are a number of biochemical changes in the tissue. The activity of a number of enzymes is changed, and there are changes in Na, K, Ca, phosphates, and 17 ketosteroids. In addition the monitoring of 5-hydroxy-indoleacetic, homovanillic, vanillomandelic and indoleacetic acids indicates that stimulation of the active points by the laser is effective. Another important testimony to its effect is measurement of the electrical conductivity and resistance of the skin before and after laser irradiation. Stimulation of nonsensitive points does not produce this result.

The current state of our technology and production make it possible to combine the effector (i.e. the laser) with a capability for detecting the points and measuring the objective effects of the treatment (AKUDIAST), which makes possible its relatively safe and effective use in treatment. For most effective use it would be advantageous to combine both capabilities in a single unit in such a

way that the measuring circuit measures the instantaneous skin resistance at the acupuncture point continuously, preferably digitally, during irradiation with the laser.

During the 4 years I carried out irradiation of 10,000 points at various locations on the human body or in animal experiments. Nowhere did I observe any damage to tissue or harm to the patient. Nor did microscopic studies show any morphological changes at the site of irradiation at powers of 0.2 to 6 mW with localization of the points and irradiation durations of 30-90 seconds and a beam width of 2-3 mm, according to the nature of the disorder and the condition of the patient. In particularly sensitive patients, there is sometimes a slight tingling sensation at the irradiated active point, and sometimes, especially in auricular usage, there is a sensation of heat spreading through the organ in question. Only rarely was there a slight discomfort or brief worsening of the complaint. This situation is succeeded by considerable relief after several hours.

The study has shown that in certain disorders laser acupuncture has results similar to those of classical needle acupuncture, in addition to which it has a number of advantages over the latter, particularly that there is no danger of infection, trauma, bleeding and the like and it can be used with patients who are fearful of the needles. When carried out lege artis [using the proper procedure] it is without danger for the patient.

In conclusion it may be said that in cases with suitable indications it is an enrichment of the therapeutic palette for a number of disorders.

8480

CSO: 2402



## ELECTRONICS DEVELOPMENT AT TESLA ROZNOV

Prague RUDE PRAVO in Czech 28 Jan 81 p 4

[Article by M.B.: "The Base of our Electronics -- Cooperation Today Provides for Future Production"]

[Text] Electronics -- and its application -- is becoming one of the decisive factors of the economic, cultural, and social development of our society. Indeed, electronics is gradually penetrating into all fields and branches of the national economy, because the utility of the machinery and installations is increasing, the production and management processes are becoming more dynamic, and there is a continuous decrease of the consumption of raw materials and other materials as well as of individual types of energy, including human labor.

Electronics makes it possible to improve the quality of the services, to improve man's health care, and is also applied in school systems and in systems of education and enlightenment outside of schools. The use of electronic elements increases significantly the defense capability of the state, it makes it possible to handle the growth of transportation and at the same time to reduce to the minimum the resulting emissions.

The application of electronics in the collection, transmission and processing of information is of exceptional significance for the management of the national economy, particularly in socialist countries. Finally, broad application of electronics accelerates and intensifies human knowledge in all kinds of areas of basic research.

In reverse, this "electronization" is also reflected in the manufacture of domestic electronic elements. In this way, the miniaturization of parts, the combination of functional units in integrated circuits, and the highly productive production technologies have made it possible to reduce in 20 years the dimensions, input, and production costs of individual basic elements to as little as one-thousandth.

At the same time, the characteristic feature of the electronic industry continues to be a rapid rate of speed of basic innovations (4 to 6 years), a feature which makes high demands on the area of preproduction research and development. At the same time, actual production does not make high demands on material resources and power resources of the national economy in terms of volume, except for the continuously growing demands for new, extremely pure materials.

The development of electronics, and particularly of the microelectronic parts base for the Sixth Five-Year Plan has been determined by the economic directive of the 15th CPCZ Congress. Also, the CSFR government has outlined the state target program for the Seventh Five-Year Plan entitled Electronics, which includes also as part of it the development of the spheres of the parts-production base handled by the VILJ (Economic Production Unit Tesla-Elektronické součástky [Tesla-Electronic Components]) concern in Rožnov.

During the Seventh Five-Year Plan, this country will start to develop the manufacture of circuits for microprocessor systems. This applies both to fast bipolar systems suitable for special use, and also to slower but widely applicable unipolar microprocessor systems.

At the end of the Seventh and the beginning of the Eighth Five-Year Plan, the plans call for starting the manufacture of circuits for microprocessor systems, which in terms of the development process will represent a continuation of the present 8080 system. The specific characteristics of these microelectronic circuits will be a substantial increase of the degree of integration, an increase of operational speed, an expansion of functional facilities, and innovation of the system's architecture. It is assumed that the problem will be solved concerning the technology of the production of microelectronic circuits containing more than 10,000 components in one circuit. This technology will make it possible, for example, to manufacture large-capacity semiconductor memories, which have a basic effect on the parameters of the resulting microprocessor system.

In addition to bipolar and unipolar memories with a high capacity and speed, the VILJ Tesla-Electronic Components concern in Rožnov shares in the research and development of a monolithic memory with magnetic fields of 250 Kbit capacity (which means the memory capacity is as much as 100 times larger than the capacity of memories manufactured in this country today), a research and development program which is being carried out at the Physical Institute of the CSAV (Czechoslovak Academy of Sciences). This so-called bubble memory represents an innovation of a higher order not only in Czechoslovakia, but on a worldwide scale.

During the Seventh Five-Year Plan, individual enterprises of the VILJ Tesla-Electronic Components will handle new technologies in the manufacture of high-voltage transistors, high-speed transistors, and highly efficient semiconductor displays of various colors, including liquid crystals. The broadest circle of consumers will probably appreciate the handling of the production technology of the color television picture tube of the PIL design, the systematic process of increasing the reliability of the manufactured components, and the start of manufacturing electronic wrist watches with an analog or digital dial, as they will the manufacture of electronic alarm clocks, table clocks, and wall clocks.

However, such an extensive innovation of the production program of individual production program of individual production units of the Tesla Rožnov enterprise would be unthinkable, if the enterprise did not have its own research base and did not maintain broad cooperation with advanced schools in the entire Czechoslovakia as well with work centers of the CSAV and the SAV (Slovak Academy of Sciences).

Cooperation with the Faculty of Electrotechnical Engineering of the VUT (Advanced School of Technology) in Brno for example is traditional now. A semester of lectures



on the subject of picture tubes and semiconductors, combined with practical training directly in the enterprise, is being organized on a regular basis in Tesla enterprises for students of the faculty. Foremost experts are giving lectures and tests under the program. The CVUT [Czech Advanced School of Technology] has also organized at Tesla in Roznov a postgraduate course on microelectronic circuits.

Indeed, it appears that in this area the research is developing on a worldwide scale primarily by the biggest manufacturers of electronic parts and installations. If the teaching in advanced schools is not to lag behind, it must be related to production as closely as possible. That is also why every year Tesla Roznov is assigning studies for diploma to several advanced schools of the technical type. Acting in cooperation with the Slovak Advanced School of Technology, it is organizing regular annual conferences on semiconductors in Bratislava, statewide seminars, and the Summer School of Microelectronics in Roznov.

On the other hand, a number of advanced schools and work centers of the CSAV and SAV are dealing with research assignments for purposes of the present and future production of individual manufacturing establishments of the concern enterprise in Roznov. For example, the Slovak Advanced School of Technology cooperates in the area of production technology and determination of purity of thin layers; the Mathematical-Physical Faculty, acting in cooperation with Tesla Lanškroun, manufacturing establishment in Blatná, had developed new, more sensitive photoelectric resistors, which are used in newly manufactured photographic instruments and exposuremeters; workers of the Nuclear and Physical Engineering Faculty of the CVUT are studying problems of laser annealing of implanted layers.

Perhaps the most significant production technology of highly integrated circuits which is being developed at present is the program of electronic lithography. The coordinators of the program are the Institute of Instrumental Engineering of the CSAV in Brno and the Tesla enterprise in Brno (Tesla Roznov also participates in the program). This program is also part of an intergovernmental agreement on cooperation in electronics of May 1979 between the USSR and CSSR. According to the agreement, Czechoslovakia is developing the functional part of the equipment related to the electronic beam, while the Soviet counterpart will equip the entire installation with control electronics. The research facilities of both countries are concentrating on a very demanding problem, because this installation will make it possible to achieve a qualitative leap forward in the construction of integrated circuits, which makes it possible to switch to micron and submicron structures. The small series of these highly demanding installations, which are to be manufactured in this country, would, in the process, take care of the overall requirements of CEMA countries.

In addition, Tesla Roznov shares in the cooperation with the USSR in the field of linear integrated circuits for television, radio, and reproduction equipment, in the development of LSI and ELSI integrated circuits and technological installations for their manufacture, and finally also in the development of color picture tubes.

Only in this way -- through a consistent application of the principles of the "Set of Measures Designed to Improve the System of Planned Management of the National Economy after 1980" to the operational conditions of the VHI Tesla-Electronic Components -- can one make effective the results of scientific-technical development and at the same time accelerate to the maximum the research-development-production-application cycle, and as of 1985 almost to double the total annual production volume. At the same time, the production of highly integrated circuits, which are the foundation of the process of electronization of our national economy, should treble.

## NEW PHARMACEUTICALS AID LIVESTOCK PRODUCTION

Prague ZEMEDLSKE NOVINY in Czech supplement ZEMEDELEC 28 Jan 81 pp 1, 3

[Article by Eng J. Parik: "Closer to Self-Sufficiency in the Production of Feed Additives"]

[Text] Modern large-scale agricultural production would be difficult to imagine without the use of various pharmaceutical preparations. These include not only veterinary medicines, but also preparations for controlling the physiological functions of organisms. Also of great importance is the production of specific substances in livestock nutrition which make possible a considerable contribution to the carrying out of the protein program.

Our research in this area has achieved considerable success in past years. This includes, for example, close cooperation in putting the growth stimulators Cabadox and Olachindox into production, the Czechoslovak discovery of the new compound Cyadox, and many other achievements. But important tasks await researchers in this area. They are formulated in the special state program for incorporation of biochemistry and chemistry into livestock production for the Seventh Five-Year Plan. The fulfillment of this program is managed by FNTIR [Federal Ministry of Technical and Investment Development] and coordinated by the Research Institute for Biological Factors and Veterinary Medicines in Jilove near Prague. Accordingly we asked the director of this institute, Prof Dr of Veterinary Medicine Bohumil Sevcik, Dr Sc, to respond to our questions.

[Question] We might begin, Comrade Chief, with the question whether it is in fact possible to exclude chemistry from livestock production.

[Answer] Given the current level of consumption of animal foods, this is indeed impossible in practice, because it would mean major national economic losses. We would have to import even more grain, oilcake and fish meal than in the last five-year plan. We do not wish to and cannot do this. On the contrary, by making better use of synthetic biochemical and chemical compounds in the feeds of domestic animals we can resolve many production, economic and health difficulties. We have proof of this. In the Sixth Five-Year Plan we did not succeed in continuously maintaining the biological standard of feed mixtures, particularly as regards sufficient quantities of vitamins, the main amino acids, minerals, and chemical and biochemical protective factors and growth stimulators. And as you know, this made itself felt, among other things, in the animals' lowered resistance to stable diseases, infection, and technological difficulties, resulting in lower livestock efficiency.

If there is a major deficiency in the feed, or if the main vitamins, amino acids, minerals and other substances are in incorrect proportion, feed consumption increases by about 25 percent. To illustrate, let me state that in the last five-year plan the broiler fattening cycle was lengthened and the average daily weight gain in pig fattening fell. And in particular, a deficiency of these substances decreases the biological value of meat, milk and eggs, which has unfavorable effects on the consumer as well.

[Question] What are the reasons that the feeds for some kinds and classes of livestock did not contain additives in the optimum quantities?

[Answer] The shortcoming was that in previous years we were unable to assure their continuous production on a scale commensurate with the growth of demand. We have to import some compounds, primarily from nonsocialist countries. But the foreign exchange allocations for them were often ill-advisedly decreased. Today it is universally recognized that it is better to buy additives, even with expensive foreign exchange, rather than large quantities of oilcake, fish meal and especially grains.

But the critical task remains: that of getting on our own feet faster, i.e. building new production capacities for the additives and biofactors for which we have suitable conditions. We also must considerably step up our cooperation with the Soviet Union and the other socialist countries so as to achieve a reasonable and mutually beneficial division of labor.

[Question] What substances are in shortest supply and which ones are the focus of our biochemical program?

[Answer] Primarily tylosin, which is an antibiotic for large-scale livestock production. It makes itself felt in a constant decrease in losses by death, in increased growth and in a relative decrease in consumption of feed concentrates, particularly in the fattening of piglets. If we could not include it in medicated feed mixtures at all, the expected direct and indirect losses would amount to about Kcs 290 million a year in Czechoslovakia. Our optimal annual consumption is 27 tons, but in 1979 we imported only 14.8 tons, and in 1980 only a quarter of our total consumption.

But our researchers have developed a way of producing tylosin and are working intensively at perfecting it. The main research was carried out by the staff of the Institute of Microbiology, CSAV, in cooperation with our institute, while the Biotika national enterprise is working out the production technology. Experimental production of this valuable substance was begun last year. The leadership organs, our research institute, the Institute of Microbiology and the relevant production enterprises have made a joint socialist commitment that starting in 1981 the Biotika national enterprise in Slovenske Lupce will gradually begin to produce the required quantities of the substance.

[Question] This is a nontraditional approach and an unprecedented pace in the research and development process. But in the past many a well-intentioned resolution has failed to achieve its full effect in the production of biochemicals. Will history not repeat itself?

[Answer] I am an optimist in this regard, because this special state program includes specific investment support as regards financing and material resources. This is very promising. Also important is the personal involvement that has developed, particularly on the part of the relevant leadership personnel, who have realized the irreplaceable importance of these substances for nourishing the populace. The return on the resources invested is also attractive. In this five-year plan we are putting 50 million korunas into construction and equipment investments. Meeting the requirement for tylosin with our own production will replace about 124 million korunas worth (in "all charges paid" prices) of imports for this five-year plan alone, to say nothing of the extraordinary economic benefit to the consumer.

[Question] What other preparations are also included in the special program?

[Answer] They include an enzymatic coccidiostat, growth stimulators in the quinoxaline series, vitamins C, B2, D2 and D3, expanded production of essential amino acids, primarily L-lysine, and in addition mineral additives such as dicalcium phosphate. Separate capital is being used to create medicated feed preparations and superconcentrates of biofactor additives. Also of particular importance is assuring the production of Oestrophan, a synthetic analog of prostaglandin, which will enable us to control the reproduction of heifers and cows and to control parturition in sows according to the requirements of large-scale production technology.

[Question] An article on coccidiostats was published in the second issue of the supplement ZEMDELEC. Perhaps you could also tell us how the research and development dealing with coccidiostat technologies is being supported.

[Answer] Every year we use about 50 tons of these coccidiostats. If there is still no hope of obtaining a licence to produce these sophisticated substances, we will try to proceed to the objective via our own path. We have already had our first research successes, so that it has become possible to look ahead to the development and even the production stages: in 1985 the construction of a test line will be completed and experimental production will begin which would satisfy about 50 percent of our needs. In the Eighth Five-Year Plan we would be completely self-sufficient in these materials.

[Question] You mentioned the growth stimulator Carbadox. What is the present status of production of this valuable substance?

[Answer] For our livestock production we need 300 tons of a 10 percent premix annually. In 1979 the Synteziá national enterprise produced 7.3 tons of this premix. The special program sets the firm requirement of constructing a production line for the entire 300 tons by 1983. It will be necessary to produce not only Carbadox, but also lachindox and other substances in the series here. From this you can see that we have a very short deadline, in order to become self-sufficient as soon as possible.

As regards the synthetic vitamins, research organizations have received the task of further improving their quality, testing new manufacturing approaches and making better use of what we have learned from scientific and technical cooperation with the Soviet Union.



[Question] According to our information the output of L-lysine by the Biotika national enterprise in Slovenska Lupca does not fully meet the requirements of our livestock production. What is the status of production of this valuable substance?

[Answer] This is an extremely valuable feed additive because, in simple terms, if we compare the nutritional value of feed mixtures, the addition of 1 kilogram of lysine represents an increase of 11 to 13 kilograms of pork. If we assume a two-thirds yield, this method could increase annual pork production by 44,000 tons of hogs, equivalent to 29,000 tons of meat on the bone.

[Question] And how well are our needs being met?

[Answer] Currently our production capacity is 3,000 tons. By 1985 we must increase it to 4,000 tons a year. The special program provides for putting additional production units into operation by 1987, which will fully meet our requirements of about 8,000 tons a year.

[Question] Now we also ought to discuss the provision of dicalcium phosphate, biofactor additives and medicated feed preparations, but let us turn instead to the problem of a synthetic with hormone activity, a prostaglandin which in this country has the designation of Oestrophan. How would you rate the research and development of this modern preparation?

[Answer] The Advanced School of Chemical Technology in Prague has worked out a chemical synthesis of this substance. In 1979 Polana Neratovice tested this production process. This year the Leciava national enterprise has already produced a total of 24,200 injection doses. Our institute has confirmed the biological effectiveness of the preparation, which is comparable to standard foreign preparations. The development of our own approach in an exceptionally short time is a major success of Czechoslovak science and shows what successes can be achieved in this area if the correct objectives are set and the necessary scientific forces concentrated on them in harmonious cooperation. In addition this research was judged in terms of a joint socialist commitment under the direct management of the FMTR [Federal Ministry of Technical and Investment Development].

[Question] This preparation makes it possible to synchronize oestrus in livestock and control parturition in sows. Thus it enables biotechnology to control the reproductive process, which is especially advantageous for large-scale production. Prosumption of oestrophan thus means a gradual introduction of synchronized oestrus in the individual branches of livestock production. What developments do you expect here?

[Answer] We expect to use 500,000 doses this year, and 3 million in 1985. Much depends on the correct and effective introduction of this preparation into agricultural practice. This is being managed primarily by the State Veterinary Administration and the state breeding enterprises. If we become one of the world's three producers of this substance we can expect to export Oestrophan, particularly to the socialist countries, as early as this year.

[Question] And on what new preparations will researchers be working on during this five-year plan?

[Answer] The special program for introduction of chemistry into livestock production assigns challenging tasks, but in terms of worldwide trends, it constitutes instead a minimum expansion in the production of these substances. Researchers face the many other tasks which have been mentioned, but in addition, while assuring the production of these substances we must consider what should be included in the analogous special program for the Eighth Five-Year Plan. I think that it will be necessary to concentrate particularly on developing processes for the production of other amino acids, particularly methionine, threonine and tryptophan. We assume that in the next few years the starting materials and intermediates for the production of these amino acids will become available. Accordingly, if we want to take the first essential step during the Seventh Five-Year Plan, additional well-founded measures to further intensify livestock production efficiently must follow in the next five-year plan.

8780

CSO: 2402

## CZECHOSLOVAKIA

### BRIEFS

**NEW RESEARCH FACILITY INAUGURATED--**A new facility specializing in research of foundry processes became operational in Brno on 10 March 1981. As a branch of the State Research Institute for Engineering Materials, the facility has over 2,500 square meters of workshops and 1,200 square meters of laboratories. The Kcs 42 million research facility includes departments that specialize in the development of metal casting technology, design of measuring equipment for foundry operations, research of casting materials and work hygiene in foundries. Federal Minister for Metallurgy and Heavy Engineering L. Gerle attended the opening ceremony in Brno. [Prague MLADA FRONTA in Czech 11 Mar 81 p 2]

CSO: 2402



PRESENT STATUS, FUTURE OF HUNGARIAN NUCLEAR PHYSICS

Budapest MAGYAR TUDOMANY in Hungarian No 12, 80 pp 899-902

[Article by Denes Berenyi, Director of the Nuclear Research Institute of the Hungarian Academy of Sciences: "Where Is It Now and Where is Hungarian Nuclear Physics Heading? Reflections on the Fifth Meeting of Hungarian Nuclear Physicists"]

[Test] The most timely areas of nuclear physics world-wide are at present heavy-ion physics, high energy nuclear physics, and the study of the very short-lived (up to a fraction of a second) radioactive isotopes. Both the first discipline, which involves not the acceleration of protons and alpha particles, but of the ions of heavy atoms up to uranium, and the second one, which consists in the investigation of the properties of nuclei rather than that of particles (particle physics) in high-energy collisions, and the investigation of very-short-life isotopes far removed from the so-called stability line, require large and expensive accelerators.

In spite of the absence of such large installations within the country, Hungarian nuclear physicists are working successfully in all three areas by taking advantage of the possibilities offered by international collaboration. Thus, Janos Ero (KFKI) [Central Research Institute of Physics] and his group succeeded in obtaining results by taking advantage of the potential of the Joint Institute of Nuclear Research [EAI] at Dubna (this research project will be continued in the near future within the framework of a collaborative effort with the Institute of Nuclear Physics at Leningrad), that lies within the reach of investigators of at most three or four institutes throughout the world. It is worth noting that collaborators from the Nuclear Physics Institute [ATOMKI] (Debrecen) participated in this work, thereby providing a shining example of cooperation between Hungarian institutes. At the same time, theoretical studies are also in progress in this timely field within the country. (For example, Istvan Lovas).

Hungarian investigators--earlier Tibor Fenyes (ATOMKI) and his group, and at present, Ferenc Tarkanyi (ATOMKI)--obtained significant results in their study of the very-short-lived radioactive nuclei--and in this case also, collaboration with Dubna and Leningrad provided access to the needed large accelerators. The Hungarian nuclear physicists will continue in the future their work in this field.

As far as heavy-ion physics is concerned, the work involves in part the activity of our outstanding theoretical physicists in this area (e.g., Jozsef Zimanyi of KFKI, Gyorgy Fay of ELTE (Jozsef Eotvoes, University of Arts and Sciences) and in part, the preparations at ATOMKI for a long-range research program in which the heavy-ion accelerators of the Laboratory of Nuclear Reactions at the Dubna Joint Institute of Nuclear Research will be used. (Dezso Varga reported at the meeting on the preparations for this program).

However, if only the above represented the area of nuclear physics, this would indicate a lack of research activity in nuclear physics and a shortage of nuclear physicists in Hungary. As a matter of fact, in addition to the above, justifiably fashionable, research areas, this field abounds in timely research problems. In these studies, the higher excited states and the still unknown, often hard to measure parameters (spin, parity, lifespan, etc) of the lower states of individual, otherwise well-known nuclei are investigated at lower energies with the help of smaller accelerators; however, using complex and ingenious supplementary devices. Intensive work is in progress in our country in this area (the group of Tibor Fenyes makes use of a special superconducting transport magnet for this work (ATOMKI); in addition, Ede Koltay (ATOMKI) and his collaborators are also active in this field). Borbala Gyarmati and her collaborators are carrying out the required theoretical studies (ATOMKI).

Without any doubt, these last-named investigations fill in "white spots"; [gaps] they are involved with the as yet incompletely known phenomena of nature, and ultimately, they will make a contribution toward the success of international research aimed at the clarification of nuclear forces.

In any case, we learn from the history of physics and science that even fields in which one does not expect surprises, can become very timely from one day to the next and all attention is focused on them, then those who happen to have gained previous experience possess a great advantage. In this respect, we are quite lucky; I do not even have to cite old examples of nuclear physics, such as the violation of parity, the Mossbauer effect, or the discovery of the analog isotopic states, because right now, a similar new "sensation" keeps the physicists in a state of excitement: determination of the finite rest mass of the neutrino (up to now, it was possible to give only the upper limits, and theoretical studies, in general assumed a zero rest mass. The method used for this new discovery, beta spectroscopy, is actually one of the most conventional areas of nuclear physics in which no "dramatic" developments were expected. But that is not what happened.

Thus, there is no doubt that anybody who concentrates his efforts on the "white spots" of nature, regardless of how small they appear otherwise, is not on the wrong path.

But that is not all! These investigations and experiences gained while working in these fields provide the solid and indispensable foundation to the multifaceted application of nuclear physics which now touches practically all branches of science and penetrates the most varied areas of everyday life. In this connection, it is of interest to examine the breakdown of the lectures at the

latest Small Accelerator Conference (November 1978, Denton, USA). Nowadays we refer to "small" accelerators up to the level of 15 MV, and the conferences involving them are organized generally every two years; these conferences represent a great event for nuclear physics and related areas. Returning to the statistics of the lectures, of the 200 papers presented at that conference about 15-20% dealt with biomedical and about the same number with analytical-industrial applications. Studies related to thermonuclear research were not far behind. (At the Meeting of Hungarian Nuclear Physicists, two sessions were devoted to this latter field of research. At one of them, the Tokamak program of the KFKI, the research results related to it, were reported, while the second session was devoted to the research activities at the Institute of Experimental Physics of the KLTE [Lajos Kossuth University of Sciences], although papers reporting results in the field of nuclear fission energetics were also included).

However, it is worth emphasizing that the relative majority (nearly one-fourth) of the papers presented at the Denton conference involved reports about the results of research in the field of high energy physics. The term "high energy" is a relative one; what is "low" energy for the nucleus, is considered "high" for the electron cloud surrounding the nucleus from the viewpoint of atomic physics. What kind of phenomena are we talking about? We are referring to the collision of electrons, primarily ions with a multiple charge, with atoms. This is a new area of reality, of nature. Previously the term of atomic phenomena referred to events involving the outermost atomic electrons. Now we are talking about the depth of the atomic shell or even the whole of the shell, including previously unknown multiply ionized atomic states, such as hydrogen-like neon or lithium-like argon. In these latter cases, for example, one electron remains near a neon nucleus or two around an argon nucleus. Such a formation (multiply-ionized atom, or to express it another way, multiply-charged ion) carries certain properties of both neon and argon or both hydrogen and lithium, because just as one or three electrons revolve around the nucleus in the case of hydrogen or lithium, neon or argon nuclei are located inside the atom rather than hydrogen or lithium nuclei. Such and similar problems represent a relatively new field of research, of interest in itself, but of especial importance by providing an understanding of nature, because according to our present knowledge, the major portion of matter of the universe in the stars and interstellar space consists of ions. In addition, this area is of great interest from several other points of view, such as the interaction of radiation and matter, understanding certain phenomena of the upper atmosphere, or especially the exploitation of thermonuclear processes for energy generation. In our country, two groups are working in this field at ATOMKI and their results were reported at a special session during the meeting.

As far as the applications are concerned (reports about the results of such studies represented the bulk of papers presented at the Meeting of Hungarian Nuclear Physicists), we can divide the so-called nuclear physics applications into two large groups. Direct applications belong in one; in this we use nuclear physics methods and results in the limited sense, radioactive isotopes, nuclear accelerators and detectors, etc. On the other hand, in the indirect application, are the non-nuclear technologies and methods (e.g. electronics, computer technology, vacuum technology, etc) which were perfected in the course of nuclear

physics investigation, and are employed to solve problems of other branches of science or technology.

We are glad to be able to report that there are many results in both kinds of applications in our country; they were reported and widely debated at the Meeting of Nuclear Physicists. Without any claim to completeness, we should mention the following "direct" applications: analytical applications of accelerators (ATOMKI, KFKI, Chair of Atomic Physics of the Lorant Eotvoes University), environmental research and other application using solid-state trace detectors (Somogyi and his group at ATOMKI), solution of problems related to industrial materials testing, process control and radiation detection by means of radioactive isotopes (Isotope Institute, the atomic reactor of the Technical University of Budapest, Central Research Institute of the Silicate Industry, Mecsek Coal Mines), application of x-ray fluorescence analytical technology, based on excitation by radioactive isotopes for solving biomedical, archeological and space problems (Jozsef Bacsó and his group ATOMKI). In addition, application of the Mössbauer effect was also reported (Denes Lajos Nagy, KFKI; Laszlo Korecz, Chair of Atomic Physics of the ELTE). We claim significant results in the field of "indirect" applications, because nuclear physics was actually the basis of the domestic fabrication of multichannel analyzers and computer production (KFKI) and to an even larger extent, of the application of modular CAMAC electronics and micro-processors (KFKI, ATOMKI). Laszlo Szabo (KFKI), and Gyorgy Mathe (ATOMKI) reported on the most recent developments in these fields. The indirect applications include also the achievements of the investigations of residual gas (vacuum technology) analyzer in the fields of biology, chemical structural research, and modernizing the industrial product structure (MEDICOR breath analyzer). (Istvan Berecz and his group, ATOMKI). At this point, we should also mention the cryological and electron-spectroscopic applications (both at ATOMKI) which are very important for interdisciplinary research and for industrial-scale materials testing. Without any doubt, both the applications, and the fundamental research focused on the "white spots" of the phenomena of nature will draw great benefit from the cyclotron which is scheduled to start its operation in this country at the end of the Sixth Five Year Plan. Alader Valek (ATOMKI) reported on the status of the project and the preparations made for immediate exploitation after the start-up.

All these are only random samples and thoughts which arose in connection with the Meeting of Hungarian Nuclear Physicists, and not a survey aiming to give a complete picture. Still, they reflect some of the characteristic features of nuclear physics and of the progress of research in the field of nuclear physics in our country. The above-mentioned "broad spectrum" applied to both the composition of the participants and the subject fields of the presentations. The goal of this conference series, which was initiated in 1967 at Sarospatak and had recently been held every two years, is to provide an opportunity to the work collectives of Hungarian nuclear physicists to examine jointly and to discuss, not only the most recent results, but also the investigations still in progress and planned for the future. This is carried out in the broadest possible sense, both as far as the subject matter is concerned, which extends from the most archane theoretical studies, to industrial applications, and also from the viewpoint of the composition of the participants, including in addition



to the staff members of academic institutes and universities, scientific workers of the Central Research and Planning Institute of the Silicate Industry, the Coal Mining Enterprise of Mecsek, who were in the audience of the meeting and presented papers. In some of the sessions, attended by specialists such as meteorologists, radiation-protection specialists, solid-state researchers, etc, who were not listed among the 130 official participants.

In summary, we can state that the present trend of Hungarian nuclear physics investigations is good and interesting. The results obtained are valuable and useful; the spirit and morale are good, and the opportunities are excellent. It is up to us to make good use of them.

2210  
CSO: 2302/39

CENTRAL PHYSICS RESEARCH INSTITUTE DEVELOPS SET OF NUCLEAR INSTRUMENTS

Budapest MUSZAKI ELET in Hungarian 6 Feb 81 p 7

[Article by T. Z.]

[Text] A set of nuclear instruments was developed at the Nuclear Research Institute of the KFKI [Central Physics Research Institute] under the guidance of Dr Peter Pellionisz, electrical engineer, department head, candidate of technical sciences, and Dr Attila Baranyai, electrical engineer, staff scientist, for research and training reactors, as well as for a variety of industrial processes. The set of instruments comprises a number of modules capable of being used for nuclear reactors and other nuclear facilities. The instruments can be combined to form radiation-protection, safety, and control systems.

The nuclear instruments of the research, experimental, and critical reactors which were in operation in Hungary, started to become obsolete during the mid-1970's. These reactors included the VVR-SZM research reactor at the KFKI, and the ZR-4 and ZR-5 critical systems and the training reactor at Budapest Technical University. By now these instruments are fully obsolete. The time has come for them to be replaced with more modern, more reliable, more accurate instruments using integrated circuits. However, instruments of this kind would be quite difficult to obtain on the international market.

The research team first developed the basic units which were capable of carrying out simple protective functions in a highly dependable manner. The required power supplies, amplifiers, limit-value indicators, and so forth were constructed. This means that the instruments required for the most important functions were made available -- and they used MSI circuits of medium complexity.



As soon as the industrial nuclear instrument family, consisting of a few dozens of modules, was completed in 1975, the users came up with additional demands. For example, they asked for more sensitive amplifiers with several measurement limits, and they also declared the need for a dosimetric system which permits the monitoring of the radiation level by feeding the signals from a large number of detectors into a central processor unit. This kind of equipment in turn requires units which, for example, are capable of measuring the radiation level at various degrees of sensitivity even in cases where the radiation level changes five- to seven-fold during the test period.

This means that the earlier modules had to be replaced with faster and more sophisticated devices, and also that the new needs could be met only if entirely new modules are also designed. These new modules included the instruments designed to contribute toward environmental radiation protection by monitoring the emergence of radioactivity over a circular area with a diameter of approximately six kilometers. This was used for the first time in Paks. On a "smaller scale," such instruments also protect the environment of the KFKI against radioactive contamination.

Hungary coordinates the development of the external radiation-protection instruments for reactors within the CEMA.

Another need arises from the fact that nuclear power plant blocks are started up in frequent intervals in the socialist countries. For example, a 440 MW power-plant block was started up last year in Bohunice, Czechoslovakia, and another such block this year in Kozloduj, Bulgaria. During such events, the physicists must carry out a large number of measurements on each and every installation before production of power can be started. The computations following the measurements so far took weeks or even months. The new Hungarian microcomputer-based equipment not only speeds up this work, but also automates it. This kind of system worked very well during the "physical startup" in both Bohunice and Kozloduj.

Now the physicists asked for equipment which not only helps during the physical startup but also permits the "criticality" of the system to be continuously monitored during reactor operation. This means continuous reactivity monitoring. Reactivity cannot be measured instrumentally; it must be computed from changes in neutron flux. Our experts designed a relatively simple and inexpensive analog reactivity-measuring instrument for this purpose. It is thus now possible to detect the hazard or reactor "run-away" as well as of dangerous output drops in time, so that the malfunctions can be remedied before it is too late.

This has the following advantages. Whenever the neutron flux suddenly increases to a significant degree, the instruments of this kind must be switched to a higher level. Computations carried out thereafter are quite unreliable. This dead time may be as much as 10 minutes in other similar instruments, and this is a period during which the power plant could even explode. However, the Hungarian analog reactivity meter takes four seconds, which is a safe period.

The number of modules in the instrument family is now about 80.

The system is in use in several locations. For example, the computerized system operates with the experimental reactor of the KFKI since 1976-1977 for measuring the nuclear processes and performing conventional control functions. The system is supplemented with basic modules. The new setup has operated satisfactorily since 1978-1979 in the control station of the university's training reactor. The competition for the renovation of the American-made Triga research reactor of the Technical Research Center in Finland, made in America, to supply the required new instruments was won ahead of such firms as Siemens, Hartmann-Braun, General Atomic, and General Electric. The contract was signed last summer, and deliveries will be completed within one year. Other countries have since also expressed interest in the Hungarian family of nuclear instruments. This was due primarily to published papers and lectures presented in international conferences.

An agreement was concluded with Gamma Works, according to which this enterprise will manufacture the instruments developed at the institute if large runs are required and also if individual complex systems are involved. This contributes to development in the domestic industry. The modules can be used for a very large variety of applications, encompassing the range from isotope applications to the study of geophysical radioactive processes.

2542

CSO: 2502

## MULTIFACETED CYCLODEXTRINS

Budapest MAGYAR TUDOMANY in Hungarian No 12, 80 pp 903-908

[Article by Eva Fenyvesi and Eva B. Dosa]\*

[Text] The cyclodextrins are ring compounds consisting of 6, 7 or 8 glucose units (Figure 1) the special properties of which lie in the fact that because of their chemical properties and size, their ring is able to enclose other molecules. The thus formed molecular unit is called the occlusion complex (or more simply, the complex) while the cyclodextrin is designated as the host molecule, and the occluded material as the guest molecules; the whole process is called molecular packaging (Figure 2). The process is quite simple: in the presence of water, in solution or suspension, under favorable conditions of energy, the components form a solid, mostly crystalline, occlusion complex. The product, which is stable in the solid state, decomposes within a short time in water (including under physiological conditions) thereby liberating the occluded molecule.

The French microbiologist, A. Villiers, observed as early as 1891 the occurrence of cyclodextrins. In a starch-containing nutrient medium, he was breeding microorganisms possessing a decaying action and designated the obtained small crystalline yield as cellulosine, because of the assumed similarity to cellulose. The properties of this material agreed with the data of cyclodextrin, reported later by the Austrian researcher, F. Schardinger. In 1903 he isolated the microorganism, *Bacillus macerans*, which produces the enzyme involved in the transformation of starch into cyclodextrin. Schardinger was the founder of the chemistry of cyclodextrins, and for that reason, these compounds are often called Schardinger dextrans. The American researcher, H. Pringsheim, recognized the complex-forming capability of the Schardinger dextrans, and this discovery is considered one of the important milestones of cyclodextrin research.

From the middle of the thirties, the German scientists, K. Freudenberg and his collaborator, F. Cramer, assumed the leading role: they proved that the molecules are cyclic compounds. They discovered in addition to the  $\alpha$ -cyclodextrin

---

\*This study received the second prize at this year's [MAGYAR TUDOMANY] competition.

consisting of 6 glucose units and the 7-member  $\beta$ -cyclodextrin, the  $\gamma$ -cyclodextrin which possesses one additional cluster. Although they recognized their stabilizing effect, even in the sixties these properties were looked upon only as a scientific curiosity.

Two related factors hindered the practical application and even any effort towards it: On the one hand, the cyclodextrins could be procured only at a high expense as a specialty chemical, and on the other hand, as a result of earlier preparation methods, the cyclodextrins contained toxic impurities in their complex form, and the toxic effects were attributed to the harmless cyclodextrins.

In the seventies, development was started in this area (Figure 3) at an explosive rate; about 60 research groups published their results about cyclodextrins. In this list, Europe is represented by 15, the USA with 16, Japan with 28 research sites. Japan plays the leading role; the research is deliberately aimed at practical application, primarily in the pharmaceutical field. A significant volume of basic research is carried out in the German Federal Republic, the USA and several other European research facilities.

#### Hungary In The Second Place

In view of the results of investigations, initiated in 1973, Hungary occupies the second place, after Japan in the international field. Nearly 30 domestic applications for patents have been made in connection with cyclodextrins, their derivatives and occlusion complexes, and about the same number of scientific articles have been published. The development of the microbiological industry and the broadening of our knowledge about cyclodextrins has made it possible to prepare members of this interesting molecular family by using a relatively inexpensive method. At present, there is only one company in the world, Nihon Shokuhin Kako, a joint venture of the Japanese Mitsubishi concern, and the American Corn Products Corp that manufactures and distributes a sizeable amount of  $\beta$ -cyclodextrins. The capacity of the plant completed in 1978 is 200 tons per year, which is far from enough to satisfy the estimated demand of the world market. In view of the monopolistic situation, the price is still quite high (\$16/kg), but in spite of this, in a few cases (in the pharmaceutical industry, the food industry and agriculture) the advantages of its application abundantly outweigh the expenses involved in forming the complex.

The most important result of domestic investigations is that the experiments aimed at the preparation of cyclodextrins were successful. The generally characteristic low production cost of fermentation processes is true also in the case of the production of the enzyme which carries out the starch-cyclodextrin transformation.

Disregarding the small amount of imported solvent, the cyclodextrins can be and, in all probability, will be produced economically from a domestic raw material (potato starch) providing an opportunity for large-scale application.

The second inhibiting factor, the uncertain toxicological effect has been also removed. At present, we can be quite certain that the cyclodextrins are harmless to health. If they are introduced into the organism orally they are not absorbed



either from the stomach or from the small intestine. In the large intestine, they are slowly decomposed under the influence of amylases, and in the blood only linear dextrans appear; they are, as it is well known, parts of the carbohydrates which form our daily nourishment. In experiments in Japan and Hungary, during which high doses were fed to dogs and rats, there was no indication of toxicity. The significance of this fact from the viewpoint of application in the food or the pharmaceutical industry cannot be overemphasized.

#### Potential For Application In The Pharmaceutical Industry

About one-third of the currently used drugs are capable of forming an occlusion complex with cyclodextrins. The limit is set by the molecular dimension and structure of the active ingredient (whether it fits within the cavity and whether it has a tendency to form complexes), and by the fact that the molecular packaging of drugs prescribed in large doses would increase excessively the size of the tablets. However, it is possible to prepare complexes of many active ingredients which, up to now, could not be distributed, because they are volatile, decompose or oxydize easily, are poorly soluble or have an unpleasant odor; complex formation may improve these properties and the ingredients may be developed into a drug prescribed in everyday medical practice.

Molecular packaging of the drugs may result in the following effects: Volatile compounds can be stabilized; liquids can be transformed into a crystalline form, which can be dispensed in the form of tablets, the solubility of compounds which are poorly soluble in water, and therefore are difficult to absorb, can be improved, increasing the rate of dissolution thus improving the absorption relations; an unpleasant taste or odor can be covered up; undesirable side effects can be decreased or even eliminated; materials which without molecular protection, interfere with each other's action, can be tabletted together, active ingredients may be stabilized, even in aqueous solutions.

Let us illustrate with some examples how these effects are carried out.

One type of the biologically active prostaglandin is the prostacycline, the complex of which is substantially more stable than the active ingredient itself. A few nanograms of this compound suffice to prevent the clotting of blood and may even dissolve the already formed thrombi. It could be used as a medicine for thrombosis, but it is so excessively volatile, that even when stored at  $-70^{\circ}\text{C}$ , it loses its effectiveness within a few months, and at body temperature it decomposes within a few minutes. The prostacycline protected by molecular packaging, i.e., its occlusion complex with cyclodextrin, preserves its anti-thrombotic effect in the blood for hours, and the sudden improvement of the storage possibilities should not be underestimated.

Nitroglycerine is a well known drug, used for the treatment of angina at a dose of a few milligrams. The compound is a liquid; it is distributed with the help of a solid carrier or in a microcapsulated form (as extremely small droplets surrounded by a solid shell). The first method does not provide a suitable protection for the active ingredient; the second, the microcapsulation, which is gaining ground slowly, is an expensive process. Experiments with molecular

packaging of nitroglycerine revealed that it is possible to prepare by means of a simple process, a preparation having a long shelf life without affecting the effect.

The unpleasant, even disgusting odor of some drugs, may be moderated by the formation of an occlusion complex. Allicine, the long-known bactericidal and fungicidal active ingredient of garlic, cannot be used due to its volatility, its tendency to decompose and its unpleasant odor. The stable occlusion complex is an excellent preparation with barely recognizable odor.

Active ingredients which are poorly soluble in water, and for that reason are absorbed only to a limited extent, become better soluble when used as a molecular package, because, instead of the crystal lattice of the active ingredient, it is the complex which contains the molecules of the active ingredient, it is the complex which contains the molecules of the active ingredient separated from each other that must be decomposed during the dissolution. As a result of the increased solubility, the ingredient is absorbed faster and better; this makes it possible to prepare higher-activity preparations. Thus, a smaller dose is required to obtain the same effect thereby reducing undesirable side effects. This applies also in the case of non-steroid inflammation inhibitors, such as indomethacine. Because of the better solubility of the complex, a higher concentration of the active ingredient in the blood may be reached, thus ensuring the same inflammation inhibiting effect using a significantly lower dose. As a result of the rapid dissolution, the local effect of the active ingredient which excites the mucous layer of the stomach is greatly diminished.

#### "Packaged" Vitamins

The many advantages of molecular packaging (stabilization, increased solubility, improved absorption) may occur jointly, for example, in the case of fat-soluble vitamins. Vitamin D<sub>3</sub> decomposes completely in the air at 40°C within three months, but in the complex, 80% of the original amount persists after three months. The vitamin itself is practically insoluble in water; however, after molecular packaging, it exhibits a clearly measurable solubility. As a result of this, its absorption is also improved. Animal experiments indicated that the complex is considerably more effective.

It is well known that it is not possible to satisfy vitamin requirements directly from food, because canned goods and partially prepared foodstuffs which are widely used as a result of urbanization are vitamin poor. Development of large scale methods of animal husbandry made it imperative to add vitamin supplements to fodders.

Under traditional conditions of animal husbandry and foddering, the animals, in their instinctively chosen and more natural fodders, usually had access to the required vitamins. As a result of the storage and stabilization conditions encountered in industrial-scale animal husbandry, the vitamin content of the required upgraded, high-yield fodders--rather low to start with--decreases significantly. This is due to the methods used to store the fodder (heat treatment, use of organic acids as preservatives) which cause the degradation of



the vitamins. The fodders contain ever-increasing amounts of natural or added materials with antivitaminic action, which interferes with the effect of vitamins. At the same time, the improved hybrid animal species have higher vitamin requirements. It is not sufficient to satisfy this requirement at the level at which the phenomena indicating the lack of vitamins disappear, but it must be ascertained that the amounts needed for the maximum development of the animals have been supplied. In order to ensure a continuous "production" of the animals throughout the year, the vitamins must be continuously supplied (e.g., in the so-called chicken factories). The stable cyclodextrin vitamin complexes, which can be conveniently stored could play an important role in satisfying the increased demands for vitamins in industrial-scale animal husbandry.

#### Preservation Of Aromas And Flavors

Large-scale, unified optimized food technology results in the uniformization and depletion of the aromatic and flavoring materials in the raw materials of our foodstuffs. This necessary process may be improved and counteracted by adding various spices to the raw materials used in our kitchens. However, most of the aromatic and flavoring materials decompose easily. By the time an Oriental spice plant reaches a European harbor, its aromatic content is greatly reduced. The seasoning, flavoring ability of our own domestic plants is also considerably reduced if they are stored for a long period before consumption. In order to reduce the losses and expenses due to storage and transportation, to facilitate handling and to simplify application, it is desirable and is becoming increasingly customary to establish processing plants at the place of production. Aromatic concentrates are prepared from the plants, and attempts are made to moderate their increased tendency towards decomposition by special packaging and by the addition of stabilizers.

Molecular packaging protects the aromatic materials completely. From liquids (for example, onion aroma concentrate) or from crystalline substances, stable cyclodextrin occlusion complexes can be prepared in the form of powder, which may be stored for long periods under ordinary circumstances. One kilogram of the "powdered onion" contains the aroma of a thousand kilograms of onion.

The aromatic materials of spices usually contain a number of components the specific ratio of which yields the flavor to which we are accustomed. It has been proven chemically that this ratio is not affected by the formation of the occlusion complex, and the original flavor is retained. Professional tasters testing their sensing organs found the molecularly packaged aromatics unobjectionable. The products may be used in dietetic foodstuffs. The patient does not have to consume the raw materials of the aromatics which may irritate the digestive tract. Very often, problems because of which doctors prohibit the consumption of certain spices, are due not to the aromatic compounds responsible for the flavor, but to the vegetable raw materials which serve as carriers. At the 1979 and 1980 Budapest International Trade Fair, several experimental aromatic complexes made from certain domestic spice plants (onion, garlic, caraway, dill) were exhibited.

### Growth-Regulating Action

In addition to molecular packaging, one of the most interesting results of domestic investigations is that it was found possible to delay for a short period the sprouting of starch-containing seeds, provided they have been previously treated with an aqueous cyclodextrin-containing solution. At the same time, the plant growing from a seed with delayed germination develops more rapidly, becomes more vigorous and presents a significantly increased yield.

The reserve nutrients--primarily starch--in the sprouting seed start to decompose under the influence of moisture, migrating from the storage to the growth organs, where new materials are synthesized from the reserve nutrients. Thus, the main characteristic of the sprouting of starch-containing seeds is the decomposition of the starch and the utilization of the thus-formed soluble sugars for the growth of the plant.

The reducing end group of the molecule to be decomposed plays an important role in the action of starch-decomposing enzymes. Because they form a closed ring the cyclodextrins do not possess a reducing end group. Therefore the starch-decomposing enzymes are able to decompose the cyclodextrins which penetrated into the seed only very slowly--several hundred or several thousand times more slowly than the starch. The delayed sprouting may be due to the inhibition of the starch-decomposing enzymes (the enzymes become absorbed with the decomposition of the cyclodextrin which requires more work); comprehension of the mechanism of the accelerated development and the increased yield requires further study.

The experiments confirmed that the cyclodextrins are suitable for influencing the sprouting and growth processes of seeds. If this method causes only a 1 to 2% increase in yield of the grain (the reproduced results imply that it is much higher), it could affect significantly the efforts to overcome the under-nourishment of more than a hundred million people throughout the world.

The possibility of manufacturing cyclodextrin, the molecular packaging of pharmaceutical ingredients and aromatics, the discovery of the ability of cyclodextrin to regulate the growth of plants are considered significant results even at the international level. The coordinated activity of the about 20 domestic industrial, academic and university research institutes, participating in the research on cyclodextrins is expected to bring not only scientific, but within a few years even economic success.

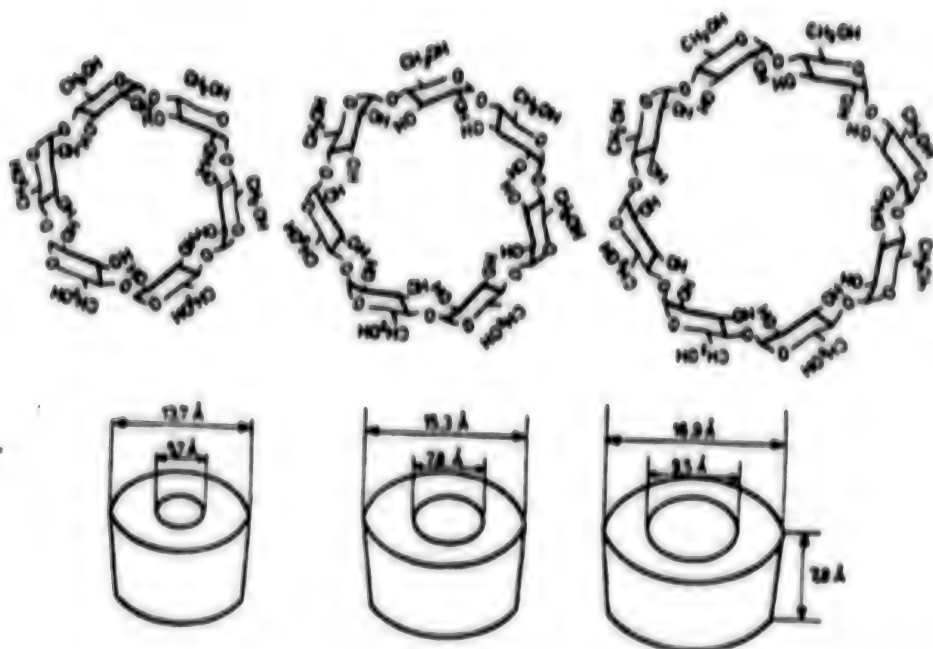


Figure 1. The structure and molecular dimensions of cyclodextrin.

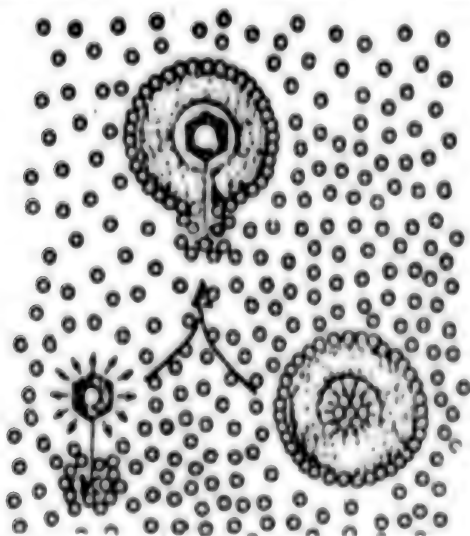


Figure 2. The mechanism of the occlusion-complex formation of cyclodextrins; the small circles represent water molecules. Because of the apolar character of the cyclodextrin cavity wall, the "occluded" water molecules within the cyclodextrin cavity change places readily with the organic molecules which also hydrate poorly in the aqueous solution.

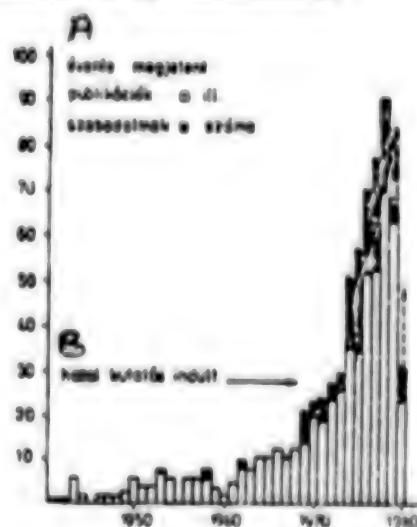


Figure 3. Growth of the technical literature of cyclodextrin research. (a) publication  $\square$ , patents  $\blacksquare$  per year (b) Startup of the domestic research.

2210  
CSO: 2502/39

## FIRST AID IN CASES OF CHOLINESTERASE INHIBITOR POISONING

Budapest HONVEDORVOS in Hungarian Vol 32 Nos 1-2, Jan-Jun 80 pp 107-122

CSORBA, Sander, Dr, physician-lieutenant colonel, SZTANOJEV, Gyorgy, Dr, physician-lieutenant colonel

[Abstract] The variable symptoms of cholinesterase inhibitor poisoning and the diagnostic difficulties are discussed in a literature survey. This is followed by a review of the initial treatment given to 55 patients treated for cholinesterase inhibitor poisoning in 1977, in Budapest. The cases were classified as mild (14), moderately severe (15), severe (12) and lethal (14). About 70 percent of them were suicidal attempts. The age of the patients, poison used, initial symptoms, data on first aid rendered, initial symptoms and treatment in terms of the various classification of cases are tabulated. It is concluded that the first aid or primary care given to the majority of cases was inadequate. More than half were not given atropine, of 49 cases of ingestion, only 8 received immediate gastric lavage and of 19 cyanotic patients, only 3 received oxygen. It is recommended that first aid instruction should stress the importance of these three basic steps. References 35: 28 Hungarian, 1 East German, 1 Russian, 5 Western

2473

CSO: 2502

## TREATMENT OF HEMORRHAGIC SYNDROME AND OF INFECTIOUS COMPLICATION IN ACUTE RADIATION SYNDROME

Budapest HONVEDORVOS in Hungarian Vol 32 Nos 1-2, Jan-Jun 80 pp 69-74

LIPTAY, Laszlo, Dr, physician lieutenant colonel, KOHALMI, Iren, Dr

[Abstract] For patients who have a chance for survival, an effective treatment of the acute radiation syndrome (not discussed) must be accompanied by treatment of the above complications to keep them alive until bone marrow function becomes normalized. In a literature survey, the etiological factors responsible for the hemorrhagic syndrome and the infections are discussed. In case of the hemorrhagic syndrome, these include the decreased number and function of thrombocytes, changes in the clotting factors and damage to the wall of blood vessels. Transfusion of a thrombocyte suspension or whole blood is used in the case of severe hemorrhages, plasma infusion is used to treat clotting disturbances. Epsilon-amino-caproic acid, PAMBA and Trasylol are given to inhibit increased fibrinolysis. Serotonine infusions, estrogens, vitamin C and calcium preparations have been tried to lower vessel permeability. Local application of clotting agents is also effective. The bone marrow aplasia will first be manifested in infectious complications in response to the decreased phagocytosis, granulocytopenia and immunosuppression caused by the early leukopenia. Prophylaxis includes sterile environment, passive immunization, prophylactic antibiotic and antimycotic therapy. Stimulation of the immune system and treatment of the infections are also discussed briefly. References 9: 1 Hungarian, 2 Russian, 6 Western.

2473

CSO: 2502



## HUNGARY

### RECONSTRUCTION OF HUNGARIAN STATE RAILWAYS TELEPHONE NETWORK

Budapest HIRADASTECHNIKA in Hungarian Vol 32 No 1, 1981 pp 21-29

LORINCZ, Endre, graduate electrical engineer, development engineer, Institute of Development, BHG [Beloianisz Communications-Engineering Factory], Budapest

[Abstract] The reconstruction of the telephone network of MAV [Hungarian State Railways], scheduled to be carried out during the Sixth Five-Year Plan, involves a change from the present rotary system to a crossbar system. Open-air type devices such as the 60-channel, two-cable BK-60-3 and the 12-channel, two-cable BO-12-E2, made by the Telephone Factory, will be used. The aim is to create a multilevel, hierarchic, cross-connected network with minimum loss, that operates in a fully automated manner and is easy to maintain. Four levels (transit center, regional center, sector center, and terminal system) are contemplated. The transit center uses the ARF-102, and the ARK-511 and -522 rural exchanges, as well as an independent four-wire version of the ARF/GVT from LM Ericsson company. Together with the ARF-102, this is also used for the regional center, and, together with the ARK-522 exchange, for the sector center. A six-digit dialing system is used, where the first digit selects the transmission routing, the second digit selects the transit center and the third digit selects the sector center. The remaining three digits select the individual terminal. In centers with more than 1,000 terminals, the second digit also provides for subselection. The traffic-control system features end-to-end selection: the initiating transit center's register controls the connection all the way. The special feature of the signaling system is that there is a signal frequency in the rest state in both directions at a low level; thus, with the four-cable system used, the faults in the transmission path can be easily identified. Call counting is in terms of both distance and time. The changeover will involve the initial use of temporary containerized facilities since the exchange rooms are completely filled with the present rotary-system devices. The design of the new system is such that the desired level of reliability and accuracy will be achieved. Most of the equipment will be supplied by the BHG. Figures 7; references 13: 2 Western and 11 Hungarian.

2542

CSO: 2502

## MERCURY CONTAMINATION IN FEED AND IN DOMESTIC ANIMALS

Budapest MAGYAR ALLATORVOSOK LAPJA in Hungarian Vol 36 No 1, Jan 81 pp 45-47  
manuscript received 17 Sep 79

BODNAR, Magdolna, Dr, SZAKOLCZAI, Jozsef, Dr, candidate of veterinary sciences

[Abstract] Mercury contamination is traced mainly to industrial pollution and to the agricultural use of fungicides and treated grain. No reliable data exist on the domestic industrial Hg pollution. Obtained from cases of suspected Hg poisoning, between 1961 and 1978, 1057 samples (mostly basic feed but also mixed feed, liver and kidney of diseased animals and some baits) were tested for their Hg content. The method used had a sensitivity of 0.2 mg Hg/kg. The results are tabulated. They show that 33 percent of the samples contained more than 0.2 mg/kg Hg, 75 mg/kg being the highest value found. While earlier Hg poisoning was found mainly in swine and poultry, today such cases are largely limited to wild animals (pheasants, wild goose, pidgeon). Since a 1968 regulation outlawing the feeding of Hg treated grains and generally limiting the use of fungicides has been in effect, there has been a significant decrease in the Hg contamination of feeds and Hg poisoning of domestic animals has also become increasingly rare. References 16: 3 Hungarian, 13 Western

2473

CSO: 2502

END

**END OF**

**FICHE**

**DATE FILMED**

4/6/51

---

BR